SFC-Jisc Outcome Agreement AY 2019-20 to 2021-22

Introduction

1. Jisc is the UK's higher education, further education and skills sectors' not-for-profit organisation for digital services and solutions. We champion the importance and potential of digital technologies for UK education and research; and do three main things:

    I. We operate shared digital infrastructure and services

    II. We negotiate sector-wide deals with IT vendors and commercial publishers

    III. We provide trusted advice and practical assistance for universities, colleges and learning providers.

2. Our research and development (R&D) work is integrated across these three areas.

3. Working closely with colleagues and sector bodies, our aim is to:

    - Deliver considerable collective digital advantage, financial savings and efficiencies for UK universities, colleges and learning providers today

    - Ensure these benefits are sustained and intelligently further enhanced

    - Do all this as affordably, efficiently and as cost effectively as possible.

4. We work in partnership with Scottish universities and colleges to ensure that they not only make the most of the digital opportunities available, but at the same time make substantial savings compared with doing so individually.

SFC funding of Jisc

5. Jisc is funded by the UK higher education (HE) and further education (FE) funding bodies to deliver essential UK-wide digital infrastructure. We are a critical part of building both the capability and capacity of Scotland's further, higher and vocational educational sectors, using grant-in-aid from the Scottish Funding Council (SFC).

6. Every developed nation needs a National Research and Education Network (NREN) to ensure it remains competitive internationally. Part of the rationale for the funding for Jisc is that it helps to ensure this network remains sustainable, whilst seeking a contribution from providers of education and research given they benefit most from such an infrastructure. However, it is acknowledged by government that it is not desirable nor feasible to ask providers to pay for all the costs of such a national infrastructure, therefore central funding continues to provide a significant proportion in the public interest.

7. The UK funding bodies have agreed a shared funding model for Jisc[1] on the basis of a two thirds contribution from HE and a one third contribution from FE. Proportions are then divided between the respective nations across the UK. The funding provided by the SFC is approximately 20% of Jisc's total core grant funding[2]. HE institutions in Scotland provide a contribution of approximately £1m. The funding bodies have recently reviewed the funding model and reaffirmed their commitment to this approach for the foreseeable future.

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[1] Described in the Jisc – HE and FE Funding Bodies Memorandum of Understanding, 2012.

[2] In 2019-20 this equates to £5.2m for HE (12% of Jisc's total funding) and £2.9m for FE (8% of Jisc's total funding).

Why this funding agreement is needed

8. Reduced public spending, Brexit, skills shortages and the need to improve the student experience and protect student wellbeing are just some of the threats and challenges facing our universities, colleges and research institutes. This agreement provides certainty to institutions as to our priorities over the next three years and clarifies the outcomes we seek to achieve on behalf of the Scottish education and research sectors. It should be noted, however, that any activity after the current funded year (2019-20) is subject to a flat cash funding settlement from Jisc's core funders, including from the SFC. Any cuts to our funding could result in some of the activity in this agreement being reduced or stopped and/or increases to the HE subscription in Scotland.

Capital funding

9. In addition to the core funding above, SFC may, from time to time, provide Jisc with capital funding for critical infrastructure investment, for example, funding to upgrade the regional networking infrastructure in Scotland.

Reporting against our priorities

10. We will report against the priorities and outcomes in this agreement in September each year for the preceding Academic Year.

Strategic context

Jisc draft strategy 2019-22

11. Our vision[3] is for the UK to be the best research and education nation in its use of digital technologies. Our purpose is to inspire and enable the UK to become a world leader in the use of technology in learning, teaching and research. Our mission is to power digitally confident communities with critical infrastructure, innovative solutions and expert advice.

12. We are driving Jisc so that by 2022 we will:

    i. Achieve financial sustainability and effectiveness, defined as progressing towards a four-year goal of generating 50% of income from non-grant sources, a surplus c£1m pa and acknowledged productivity improvements

    ii. Build and run added value products and services for our members, defined as each product line having a vibrant development pipeline that provides something different to the commercial market, at a beneficial price

    iii. Provide thought leadership that leads to our members transforming the way they do things

    iv. Deliver great member and customer experience as measured by their growing satisfaction, with a long term aim of +95%

    v. Maintain our funders' confidence so they continue to fund us, at least at today's levels

    vi. Transform ourselves so we recognised to be the best in our chosen fields

13. We also have a number of sector specific strategies, with associated priorities and targets for the period 2019-22. We include a selection of these targets within this agreement as examples of indicative outcomes over the period. These may be updated annually.

14. Against this strategic backdrop, we recognise that the so-called 'Industry 4.0' technologies such as artificial intelligence (AI), the Internet of Things (IoT) and machine learning are changing industry and the workplace but are yet to be fully realised across tertiary education. We have

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[3] Jisc's strategy and priorities for 2019-22 will be finalised in late September 2019.

therefore developed a 15 year vision to guide our R&D: 'Education 4.0' and 'Research 4.0' which will explore ways for education and research to take advantage of the new technologies.

15. Jisc also considers the high level priorities of the SFC and the Scottish Government, for example:

- SFC Strategic Framework 2019-22
- Scotland's College and University sector ICT strategy 2019-21
- Digital Scotland
- Working collaboratively for a Better Scotland: outline strategic plan 2018.

Observable technology and sector trends over the next 3 years

Education and research finance

16. Funding is under pressure for Scotland's colleges and universities. The gap between colleges' income and expenditure is widening. Universities face similar pressures, and the recent Augar recommendations, if implemented, could result in a loss of income from the Barnett Formula and from English students studying in Scotland. All nations are likely to see a reduction in income from international students due to Brexit.

17. Added to this, universities are under increasing pressure to spend more in order to protect pension arrangements. The uncertainty regarding the UK's access to EU research funding after Brexit certainly makes planning future research problematic. The UK pledge to become the most innovative country in the world and increase its total R&D expenditure to 2.4% of gross domestic product (GDP) by 2027 highlights the need to invest in infrastructure and staff skills so that R&D capability can sustain this target growth.

18. Part of the response by universities and colleges must be to work more efficiently and effectively. Technology can keep costs down and bring more efficient working. For example, a range of data sources, AI-based infrastructure and tools can save staff time and effort preparing research proposals and analysing funding opportunities. Efficiencies can also be achieved by competing in the online space and by implementing smart and intelligent campus technology to ensure resources are being fully used. The University of Glasgow, for example, has collaborated with the wider Smart City initiative to create a smart campus.

Student experience

19. Universities are wrestling with the changes required to meet the expectations of students who now view HE as an investment as much as a rite of passage. Colleges share many of the same expectations from students around quality, employability and overall appeal. Incoming students have expectations around technology, given their experiences of edtech and resources in schools, and these have cost and infrastructure impacts on colleges and universities.

20. Across UK society, problems with mental health and wellbeing are on the increase and universities and colleges are no exception to this. Whereas Learning Analytics uses data to inform decisions – from individual to curriculum level–concerning students' learning, data may also be used to inform decisions about their wellbeing. Possible applications cover a very wide range: from screen-break reminders to alerts when a student appears to be at risk of suicide. Clearly this will involve both significant benefits and risk.

Skills gap

21. Some employers still struggle to recruit college and university leavers that have the right entry level skills and who lack relevant work experience that employers expect. Most skill gaps are addressed by employers by providing training.

22. This broad challenge covers the digital skills of students and specific skills required by certain trades or industries as well as softer employability skills such as problem solving, communication and collaboration. It also encompasses concerns, from colleges in particular, that the qualifications system in the UK is too inflexible and slow to respond to changes in the skills required. A syllabus can be out of date within a year but qualifications boards do not have the pace to react accordingly. Staff digital capabilities also need to be addressed.

23. Universities and colleges are making inroads into improving learners' employability skills, particularly in relation to technical and digital skills but clearly more can be done, particularly in light of fierce competition from the private sector with provision such as Google Digital Garage and even from less obviously digitally focused industries, such as the banking industry (e.g. Barclays Digital Confidence initiative).

Managing physical, virtual and data estates

24. For universities and colleges, managing estates is increasingly complex and requires balancing the requirements and opportunities of the physical, virtual and data estate. One of the largest expenses for universities and colleges is their campus and demand for on-campus education remains high. Online and blended learning remain important tools for face-to-face education as well as distance learning. Universities and colleges need to ensure they get the most out of the investment in the campus (while still providing a compelling online offer). Changes in technology as well as changes in the way people want to study, such as increasing numbers of commuter students, mean that universities and colleges need to innovate in the way they deliver education using technology while, in the longer term, considering fundamental changes to existing course structures.

Innovations in teaching in learning

25. Institutions are seeking to innovate in order to reach more learners, give a better experience to those they have and deliver on their own distinctive educational mission. Active learning, peer-to-peer learning and increased interaction in learning are increasingly in evidence and personalised, adaptive learning has long been a goal in both colleges and universities. Lifelong – and 'just in time' – learning is needed in order to enable people to up- and re-skill throughout their lives and careers and it is vastly enabled by online learning.

26. The National Retraining Partnership is designed to enable the workforce to up-skill and retrain where necessary. There will also be Regional Retraining Partnerships, involving colleges and universities, following the PACE model. PACE has proven very effective in the aftermath of the financial crisis and the recession. These developments are likely to see a move to micro-credentialing enabling employees to gain credits for short, sharp acquisitions of knowledge/skills. Technology will have a role to play in recording and aggregating these micro-credits.

27. Assessment also needs to change for a digital age - both the use of technology to support formative assessment and rapid feedback, and a rethinking of what kinds of assessment task are meaningful and possible with digital technology.

28. What cannot be predicted yet is the disruption of the current and future edtech start-ups. While the initial concerns around MOOCs seem to have subsided for the time being (and important lessons were learned through the development of MOOCs), there is no room for complacency when it comes to edtech developments. There is a lot of appeal to a low cost technological solution to continuing education. Colleges and universities must be cautious about dismissing edtech start-ups as a passing fad and instead should aim to learn from their successes and consider their own ways of being more agile and responsive to ensure they are not 'out-innovated' by new suppliers in the market.

Attracting and retaining talent

29. Recruiting and retaining high quality researchers and lecturers is frequently listed as one of the critical issues facing UK universities. Advanced digital and computational skills are in high demand in the well-paid commercial sector, so universities and colleges need to develop career structures that will nurture and retain staff with those skills. These staff will also contribute to knowledge exchange within the economy, which will be vital post-Brexit.

30. International branch campuses and partnerships will be increasingly important to mitigate against threats to freedom of movement of staff and students and climate change. Changes are also taking place within existing infrastructures – for example at Abertay University where the concept of a sticky campus has been built into its estates strategy.

31. The College Sector Statement of Ambition 2018-2023 from Scotland's Colleges states that it will deliver a transformational programme of change by developing the college workforce for the future. Teaching staff will require updated and different skillsets, including STEM and technology subjects which have traditionally been difficult to recruit. Digital technology may also incentivise teachers to work at Scotland's colleges, and help those colleges to make informed decisions about finding, recruiting, retaining and utilising key talent.

Open science and research infrastructure

32. UK academic research has never had greater impact and connection to society. Nor, thanks to digitalisation and open access, has it ever been more widely available. However, this has also led to greater scrutiny and exposure of questionable research practices, which can be seized upon in a heightened political environment of 'fake news' and misleading narratives.

33. This concern for research integrity, plus inadequate reporting of the data, software, methodology and inputs. has led to questions being raised about how reliable research is, especially experimental research, and claims of a 'reproducibility crisis'. Demands on researchers, including metrics and institutional performance methods, can create incentives which can lead to undesirable results, including false citations, rushed research and exaggeration of results. Universities risk serious damage to the reputation of their research and to their status as curators of academic values. They also risk losing opportunities to collaborate with other academics and with industry. Tools incorporating AI with text mining may help to identify questionable citations and research.

34. Open science practices, such as the pre-registration of study protocols and analysis plans, and the publication of data alongside articles, are a very positive development. For research to be truly 'open' both the findings and the data behind these results need to findable, accessible, interoperable and reusable (FAIR). These approaches require policies, infrastructure and platforms (such a Jisc's open research hub). Technology has a role to play in making good research data management easier and better integrated into research workflows. While the building blocks already exist in part, they need to be developed with the right relationships, structures and metadata to create reusable research packages and pipelines, with the infrastructure to exploit them.

Cybersecurity

35. Universities and colleges rely on their reputation and credibility to attract students, funding and deliver impact. Yet the data they hold on their students and staff, as well as their cutting-edge research, makes them popular targets for cyber-security attacks. For example, the FE sector saw 12 distributed denial of service (DDoS) attacks on average per week in 2017. This is a quarter of all UK colleges, and the numbers are rising annually.

36. All students at our institutions should expect a basic level of IT and network infrastructure to be in place that meets robust, requisite security standards and protects their data. Equally, staff and students should be equipped with the necessary skills and digital capabilities to avoid falling for phishing and other security threats.

Priorities

Cyber security

Context

37. Good cyber security relies on secure critical infrastructure. The Jisc-run Janet Network provides the UK's research and higher education sectors with access to very high-speed, reliable connectivity, with in-built cyber security. Effective and secure access and identity management are also key to good cyber security. The UKRI research and innovation infrastructure roadmap (to which Jisc contributed) anticipates a national federated AAAI infrastructure[4] to increase the security of researcher data and resources.

38. The Cyber resilience policy for Scotland aims to build on the solid foundation of the National Cyber Security Strategy and move Scotland to a stage where everyone routinely recognises and manages risks, as well as becomes a leader in meeting the growing demand for cyber skills talent. Similarly, the UK government's policy paper on the cyber security skills identifies a cyber security capability gap and aims to increase cyber security capacity across all sectors to ensure that the UK has the right level and blend of skills required to maintain our resilience to cyber threats and be the world's leading digital economy.

What Jisc already does

39. We work to protect the Janet Network and securely connect organisations. This includes:-

- A security operations centre that detects and defends against thousands of attacks every year on the Janet network. Our incident management and alerts protect Scotland's institutions against major issues - such as distributed denial of service (DDoS) attacks. They also provide actionable intelligence for malware and other vulnerabilities that may be exploited to cause confidentiality breaches and loss of data.

- Our trust and identity services enable secure authentication and access for staff and learners to resources and facilities, as well as secure encryption for web and email services. These services include:

  o UK Access Management Federation

  o OpenAthens (single sign on)

  o Eduroam

  o Assent

  o Certificate service

  o Domain registry.

- Protection for individual organisations/IT estates. For example, we help colleges such as Forth Valley College implement a robust cyber security strategy to ensure the cyber safety of their college, their data and their people.

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[4] Towards a UK National AAAI Federation (Authentication, Authorisation and Accounting Infrastructure), UKRI White paper, March 2019.

- A range of (DDoS) mitigation services to reduce the risk of losing a network connection – avoiding inconvenience, reputation loss or financial damage.

- Services for added layers of defence: penetration testing, web filtering, cyber security financial x-ray and cyber security assessment.

- Close alignment with the National Cyber Security Centre (NCSC) strategy for active defence.

- A range of topical cyber security training and thought leadership (including annual conference and cyber security survey).

What will Jisc have done in 3 years' time?

40. **Vision:** In three years, Scotland's education and research organisations will be more cyber resilient, better able to respond to security incidents and will have the ability to demonstrate an increased cyber security posture. To achieve this, we will:-

   ➤ Increase the numbers of Scottish institutions using our cyber security portal, penetration testing service and our enhanced DDoS service so that more institutions benefit from enhanced protection of their IT and data estates, more quickly and using real-time data.

   ➤ Develop a range of tailored, actionable intelligence feeds delivered to our members, aimed at different levels (e.g. network operations, senior management).

   ➤ Develop new, enhanced sector-wide services to protect our members against emerging cyber risks (e.g. enhanced digital forensics capability in our security operations centre and a new resolver service incorporating the ability to use our DNS infrastructure to filter known bad domains (RPZ)).

   ➤ Explore how the technology from our SafeShare service can instead be incorporated into our security portfolio as a core capability to protect research projects both nationally and internationally.

   ➤ Improve our position as a thought leader in cyber security.

   ➤ Develop our cyber security portal to report on a wider range of services and introduce self-serve capability.

   ➤ Ensure that Jisc's student voter registration service is fit for purpose for the Scottish context, in discussion with the Scottish Assessors Association.

   ➤ Review the new range of trust and identity services we offer following the 2019 merger between Jisc and Eduserv to ensure that they meet sector needs in the context of more balanced business models, the wider range of research e-infrastructures and resources needing managed access, and the direction of the UKRI research and innovation infrastructure roadmap.

Cybersecurity: indicative outcomes		
Priority	**2019-20 outcomes**	**2021-22 outcomes (Subject to funding)**
Enhanced cyber security services taken up	- 400 HE & FE members (80 in Scotland) using the cyber security portal - Increase usage of penetration testing service by 10% - 77 enhanced DDoS services taken up by HE & FE members (15 in	High take-up of cyber services with services changing to meet the fast moving member requirements in this area.

Cybersecurity: indicative outcomes		
Priority	**2019-20 outcomes**	**2021-22 outcomes (Subject to funding)**
	Scotland)	
Enhance our DDoS and critical infrastructure hardening		Develop further new capability to provide efficiencies in the detection and visibility of DDoS incidents on the Janet network.
Further development of cyber security portal including access to 'self-serve' for members	Complete development of member self-serve capability in the cyber security portal.	

How this will benefit Scottish institutions?

41. Increased take-up of our cyber security services will result in safe and seamless access to the network for Scotland's universities and colleges, with proactive detection and resolution of issues that might affect availability. More institutions will avoid unnecessary costs and protect their IT and data estates, intellectual property and reputations. They will be able to access affordable end-user security training to upskill their staff.

42. Having access to real time DDoS mitigation and network traffic data through our cyber security portal will mean that organisations can react to incidents more quickly, and directly from the portal. They will also be able to request additional products via the self-serve feature.

43. For researchers, Jisc's access and identity management solutions will facilitate reliable, seamless and transparent access to potentially high volume, geographically distributed and complex data with many owners, to distributed and varied communities of researchers who wish to share and work collaboratively, and in a secure manner.

44. Our cyber security thought leadership will help raise awareness of the need to do more than just implement the right technology to defend against cyber incidents but also the need to upskill existing staff and students with the required digital capability to combat cyber incidents, and prevent them from happening in the first place.

45. Wide spread intelligence sharing nationally and internationally will assist in crime investigation and provide information to connected organisations on emerging and ever-changing security risks and threats.

Efficient institutions

Context

46. Pressures on public finance in education are leading universities and colleges to look for more efficient and effective ways to deliver services. One high-level aim of SFC's strategic framework 2019-22 is to ensure colleges, universities and specialist institutions form part of a successful, world-leading, coherent and sustainable system of education. Digital Scotland: Digital connectivity aims to deliver a world-class, future proofed digital infrastructure across all of Scotland by 2020 and city region deals welcome data innovation in order to improve regional economies. Scotland's College and University sector ICT strategy calls for improvements in ICT efficiency and productivity to be enabling, and include improved responsiveness, personalisation and usability. The strategy also aims to ensure institutions are maintaining their GDPR compliance as a core operational process.

What Jisc already does

47. Jisc provides value to our member universities and colleges, and saves them time and costs. Examples include:

- Access to the highly reliable and secure Janet Network allowing institutions to connect and collaborate anytime, anywhere. Janet is supported by a range of services offering secure and seamless internet access and roaming across organisations (e.g. Eduroam), locations and devices. This includes IP network connections with high availability and uncontended bandwidth to support innovation, research and learning.

- Jisc's competitive cloud solutions include access to a range of frameworks together with consultancy to help institutions achieve their strategic goals by moving IT functions into the cloud. This includes advice from those experienced in solving complexities relating to security, legal, cost, capability and service assurance specifically within the education context. If required, we can also provide additional data centre capacity.

- High-level advice and guidance on IT infrastructure via our account managers, as well as a range of online guides on reducing costs, and being more efficient and effective with digital. We can also provide bespoke consultancy through our infrastructure review service.

- Expert guidance on GDPR, data protection and other regulatory developments.

- High-quality training designed for university and college staff to develop in-house expertise and make the most of our services and solutions. A range of sessions covering more efficient and effective working including on information security, GDPR, Prevent, using free network tools, etc.

- Development of new technologies helping institutions to manage their estates, a task that is increasingly complex and requires balancing the requirement and opportunities of the physical, virtual and data estate. This includes our intelligent campus pilot for which Fife College and University of Glasgow are pilot participants exploring how data collected by IoT sensors can be used to manage assets and resources effectively. It also includes our CPD service for HE staff, helping them to create unique data visualisations with data sets (Analytics Labs). Since 2015, at least 25 Scottish HEIs have participated in one of our Analytics Labs, working on challenges such as on supporting students through their HE journey, estates/student residences and funding/finance.

What will Jisc have done in 3 years' time?

➢ We will continue to run our 3-4 year programme to upgrade and rearchitect access to the Janet Network infrastructure across the UK to meet the growing demands of our members. Subject to funding in Scotland, all regions will be designed, delivered and transitioned by 2020-21, with the rest of the UK's regions also to be transitioned by 2021. The new infrastructure design will involve creating resilient rings based on a combination of telephone exchanges, carrier neutral data centres, dark fibre and a range of ethernet and optical based services from Openreach.

➢ To save institutions time and money from developing and maintaining their own separate systems, we will increase the number of Scottish HEIs subscribed to the student voter registration service. It is hoped that this will also encourage more Scottish students to engage with the democratic process.

➢ We will explore subscription and licensing agreements with other NRENS for the use of our technology and services in order to benefit from increased income.

➢ We will increase take up of Eduroam, particularly in colleges, so that more staff and learners may benefit from seamless, 24/7 access to the Janet Network regardless of location.

➢ We will continue to monitor developments with 5G and participate in testbed activity with participating members.

➢ We will establish and grow a mature cloud service portfolio including capability for providing professional services and consultancy. It will include a fully integrated Jisc cloud management platform providing a single portal for the provision, procurement and management of members and Jisc's own cloud; a pool of experts highly competent in all aspects of cloud including technical and service, billing and contract management; and a national level solution to support research and scientific computing.

➢ We will negotiate additional framework agreements and managed services.

➢ We will launch our intelligent campus service, helping universities and colleges move from 'smart' campus to 'intelligent' campus, by making more effective and efficient use of their physical estates, from room use to energy consumption. While we are developing this as a paid-for service, core funding from SFC will continue to support related advice, guidance and community activities, which will be free to all of Jisc members in Scotland.

➢ We will develop and launch an attendance monitoring solution to help colleges easily comply with Tier 4 visa requirements, leveraging the existing learning analytics assets.

➢ During the first quarter of 2019-20, Jisc account managers will engage with Scotland's colleges in order to provide, for each institution, a short appraisal of infrastructure against institutional strategy. The exercise will provide insight for each institution into the capability of IT infrastructure (both end-user and network) to support the overall college strategy, highlighting the areas of greatest risk, and the areas of greatest priority. The exercise will be carried out through structured interviews with senior management as to college strategy, and with the head of IT and other relevant technical staff.

Efficient institutions: indicative outcomes

Priority	2019-20 outcomes	2021-22 outcomes (Subject to funding)
Intelligent campus service	- Service launch July 2020 - Marketing and promotion to Scotland's members with a view to maximising engagement	Take up by 19-23 HE & FE UK institutions (2-4 in Scotland)
College infrastructure review to identify ICT priority areas for improvements to Scotland's colleges' infrastructure	- Jisc account managers to compile short summary for each Scottish FEC and identify development priorities (for essential underpinning infrastructure) for all colleges over the next 3 years.	
Janet transitioned to new access structure		All areas/regions transitioned by 2021-22 Janet connectivity services will be delivered to all members in a more efficient and agile manner.

How will this benefit Scottish institutions?

48. The new access infrastructure for Janet will be more consistent, agile and secure so that institutions will be able to innovate in the ways in which they deliver education using technology (be it online, blended or distance learning), both locally, across large geographical distances and internationally. Universities will be able to meet the bandwidth and capability demands arising

from ever-increasing volumes and complexity of research data and its processing. The rearchitect will also give Jisc the opportunity to embed the tools required for improved cyber security, and also reduce Jisc's running costs.

49. Our intelligent campus service (and advice and guidance) will enable Scottish institutions to take an institution-wide approach to the consolidation and use of data which can enhance security and compliance, cost savings and analytics capabilities. There will also be direct benefits for students who will receive a richer experience of learning and will be able to optimise the comfort and convenience of their physical environments. Institutions will also be able to link into the 'Smart Cities Scotland' initiative.

50. The Jisc review of college IT infrastructure will guide investment to ensure that the provision of network, facilities and equipment is ready to support each institution's strategic direction, and will allow colleges the opportunity to reappraise capital spending on the basis of strategy rather than legacy.

World leading research

Context

51. Scotland's universities have an outstanding reputation and record of success in research, appearing prominently in international rankings of research universities and attracting high levels of research funding. One core objective in SFC's strategic framework 2019-22 is "to invest in excellent research and innovation that adds to current knowledge, delivers economic and societal value, enhances Scotland's international reputation and attractiveness, and makes the world around us prosperous, healthier and more sustainable".

52. The increase in digitisation and open access publishing has increased attention on research integrity. There is a requirement for Scotland's HEIs to engage with sector-wide concordats on open research data, public engagements and research integrity.

53. Both Working collaboratively for a Better Scotland and the City region deals are intended to increase the contribution of university research and in-demand graduate skills to national and regional economies. A growing number of digital competencies will be required by researchers to generate and use massive and/or very complex datasets, shape and responsibly use AI and robotics, ubiquitous connectivity and IoT environments in the 'Research 4.0' world.

What Jisc already does

54. We provide shared services, infrastructure and advice to help institutions manage their library resources, research publication lifecycle and research outputs. This includes:

- A resilient, flexible and cost effective infrastructure (the high speed, high bandwidth Janet network) on which researchers can rely to provide the necessary administrative and research services wherever that may be in the world. As well as enabling equipment sharing, the network supports high-end data transfer and collaboration. For example, in 2019 we agreed to provide a 100Gbit/s upgrade to the Advanced Computing Facility run by the University of Edinburgh through the Edinburgh Parallel Computer Centre. This site houses the UK National Academic supercomputer - ARCHER - and other facilities. The upgrade will provide the site with a solid foundation capability for a few years ahead and is an important component of the UKRI national e-Infrastructure.

- Our trust and identity services enable secure and seamless authentication and access for the UK research base to resources and facilities. This includes access to the UK Access Management Federation, OpenAthens, Eduroam, Assent, certificate service and domain registry.

- Negotiations with publishers at a national level to procure and license affordable digital content for the UK research community, and to enable a fast and cost-effective transition to open access, working in partnership with the Scottish Higher Education Digital Library (SHEDL).

- Core library support services (e.g. the National Bibliographic Knowledgebase provides researchers and students with convenient access to scholarly resources).

- Maintenance of, and access to, key research resources, including special collections, archives, journals, monographs, geospatial and digitised collections (e.g. the Wellcome collection) and advice and guidance on preservation and data and text-mining capabilities for research across Jisc's content services.

- Tools and services around the management, curation and discovery of research data (Open research hub, digital tools and services to support research replicability and verifiability publication) and tools and services to support the open access/open science paradigm (e.g. CORE, Publications Router).

- Identification of opportunities to support our members in their preparations for the next REF, for example piloting a 'prediction market' tool to enable HEIs efficiently to optimise their submission of outputs.

- Membership of the Forum for Responsible Research Metrics. We have also prototyped various analytics tools with HEIs and funders. Examples include our Open metrics lab which supports the development of innovative new forms of research metrics, and Analytics Labs dashboards on research reproducibility (in close partnership with the University of Edinburgh) and outcomes from research spend.

- Advice and guidance to universities on various aspects of research management and the research process including advice on regulatory issues (e.g. on the implementation of GDPR as part of research).

- International research sector leadership through various infrastructure collaborations and partnerships, such as the Jisc UK ORCID consortium, the Knowledge Exchange, GÉANT, Internet2, OpenAIRE, EUDAT and EGI as part of the emerging European Open Science Cloud, for which we are partners in several preparatory EC projects.

- Licensing terms for digital content and resources enabling researchers based at overseas campuses to have equivalent access to those in the UK.

- Robust relationships with the key sector organisations such as Vitae, ARMA, SCONUL and others. We have been central in drafting key elements of the e-infrastructure section of the UKRI research and innovation infrastructure roadmap, in particular those on the network, access and identity management, and research data infrastructure (for example, working with experts from the Edinburgh Parallel Computing Centre).

Open access good practice

In 2016, the University of Glasgow took part in Jisc's open access (OA) pathfinder programme, part of our OA good practice project, along with a community of practice of more than 200 professionals from 90 universities, sharing examples of open access good practice. The University's Research Information Manager said:

"During 2016 we completed our end-to-end open access project, supported by Jisc under its open access pathfinder programme.

> *While open access is a very active topic and the work we did around reducing the burden of open access implementation would have been taking place regardless, the benefit of Jisc support was that the coordinated approach acted as a catalyst.*
>
> *Outputs were delivered more expediently and there was increased sharing of information and development work with other institutions at different stages in open access process and system development.*
>
> *Several workshops took place in association with the programme and it was clear from feedback that the opportunity to talk about common issues was appreciated. As a result, the new open access Scotland group has been set up to provide a voice for open access in Scotland."*

What will Jisc have done in 3 years' time?

55. **Research vision:** for a seamless, interoperable digital infrastructure that enables Scotland's researchers and research organisations the freedom to apply their strategic resources to maximise the excellence, integrity and impact of their research, and to minimise the cost and burden of the supporting operations, wherever that may be in the world.

56. Jisc will continue to be steered by a group of Pro-Vice Chancellors for Research from UK institutions; Scottish representation is from the University of Dundee and the University of St Andrews.

57. **Libraries vision:** We will work with our members and library stakeholders to ensure that by 2022, learners and researchers in Scotland will be able to locate and access the most relevant, appropriate and readily available content from any place, on any device, via global search engines or customisable digital interfaces.

Priority areas and what Jisc will do

58. Jisc's PVC for Research steering group has identified several priorities for research. We have planned our research and libraries activity to address these as appropriate to digital technologies and Jisc's mission and remit:

- **Expertise needed and developed by research sector:** For the research sector, this is about attracting, retaining and developing the best people, by promoting close relationships between teaching and research, that provides an environment that is good for their well-being, enables researchers continuously to enhance their skills in the context of rapidly changing technologies and regulatory frameworks, actively supports equality, diversity and inclusion, enables mobility across sectors and internationally, supports team-based research, provides a positive research culture, and rewards public engagement to inspire future researchers. Under this priority we will:

  ➢ Launch a research skills digital capability service for university and research groups to help their staff to reflect on and improve their digital experiences and competencies for research and research management, and provide business intelligence to help universities plan and implement changes and invest wisely in technology.

  ➢ Prototype, pilot and release analytics tools that enable universities and funders to explore issues related to staff and research students, for example on equality, diversity and inclusion (EDI), and staff/student mobility.

  ➢ Grow training for discoverability of digital collections and expansion to the archive sector.

- **Research excellence:** For the research sector, this is about enabling excellent, cutting edge, pure and applied research and innovation that appropriately exploits the potential of digital technologies in an increasingly data-intensive and interdisciplinary environment. It is also

about highly professional and cost-effective business processes that support research, including research management and libraries. Under this priority we will:

- Increase participation in Open research hub (ORH), a single interoperable system for managing, preserving and sharing institutional digital research data. Participation will support excellent research practice plus help Scottish universities to comply with the Concordats on research data, engaging the public with research and research integrity noted in the SFC's Outcome Agreement Guidance for 2019-20. While the ORH is a chargeable service (intended to recoup the cost of service delivery only), core funding from the SFC will allow us to offer the following free of charge to all members in Scotland:

  - Research data blog

  - Best practice and guidance

  - Events/workshops (e.g. Digifest, and more research-focussed events)

  - Reports (e.g. Research Data: What to keep, FAIR in practice, Sowing the seed: Incentives and motivations for sharing research data, a researcher's perspective and Directions for Research Data Management in UK Universities)

  - Toolkits, e.g. on research data management

  - Outputs from the Knowledge Exchange.

- Convene an informal working group in 2019 to develop a more detailed roadmap for the national common authentication and access (AAAI) eInfrastructure described by UKRI to support the UK research base.

- Pilot and, if successful, roll out access to common research tools such as active data storage and e-lab notebooks, through cloud hosting and delivery, framework agreements, interoperability with Jisc and other platforms, or a combination of these.

- Support researchers, institutions and funders in the systemic transition to open access and the management of the open access lifecycle for research outputs.

- Renegotiate most/all deals with journal publishers to be transformative open access agreements in compliance with the policies of the SFC, and funders such as UKRI and the Wellcome Trust, who are signatories to Plan S. We will develop approaches that also work with smaller / society publishers and we will work closely with the Scottish Higher Education Digital Library (SHEDL) to ensure that the objectives of Scottish institutions are achieved via our licensing negotiations.

- Investigate and, if viable, deliver a new service to evaluate the value of Big Deals for journal subscriptions in light of evidence on cost, usage and availability of alternative open access versions. This service will provide dynamic evidence-based support for local and national decision making on the continuation or cancellation of subscriptions. Jisc will aim to form an agreement with SHEDL for all Scottish HEIs to sign up.

- Deliver a scaled up and fully-featured National Bibliographic Knowledgebase service on a business as usual basis which is an established and accepted critical component of the national library data infrastructure.

- Provide and develop a suite of services that support libraries and their users in access, delivery, management and use of content and library services. For example data and analytics tools to help libraries assess the usage and value of their resources such as JUSP and IRUS-UK.

- Develop new models for the creation, promotion, licensing and sustainability of special and archival collections.

- Investigate innovative technologies (including Text Data Mining and AI), trends and developments, business and licensing models that have implications for and are relevant to our library stakeholders and support them in the process of adoption, implementation and delivery.

- **Integrity and ethics:** For the research sector, this is about making sure research is ethical (e.g. 'responsible research and innovation'), and has integrity (e.g. is trustworthy, perhaps reproducible), transparency (e.g. open research) and security (e.g. cybersecurity, information assurance and data protection). Jisc will:-

  - Aim to build a Jisc open science service from existing and new components. This will support research excellence and integrity, by allowing research to be shared openly and cost-effectively, subject to wider scrutiny and to be reused and replicated.

  - Enable UKRI open access policy and Plan S (an open access initiative to make all scientific works to be free to read as soon as they are published) to be implemented with minimum administrative burden, e.g. using shared infrastructure and services wherever possible.

  - Prototype, pilot and release analytics tools that enable researchers, universities and funders to explore issues related to research integrity, open science and reproducibility.

- **Knowledge exchange:** For the research sector, this is about enabling research and innovation collaboration with business, civil society, culture, policy and society, etc, across all parts of the UK / regions, leveraging private and charity investment toward the target of 2.4% UK GDP invested in research and development, while recognising and protecting the unique contribution made by public, academic research. Jisc will:-

  - Collaborate as appropriate with Research England in the delivery of visualisations for the KEF. Prototype, pilot and release other analytics tools that enable researchers, universities and funders to explore issues related to knowledge exchange.

  - See 'Greater Innovation in the Economy' section below.

- **International:** For the research sector, this is about identifying and pursuing opportunities for collaboration, and providing a research environment that encourages international investment and staff mobility, and that benefit from compatible policy, regulation and infrastructure in the context of Brexit. Jisc will:-

  - Provide services and resources that enable UK research e-infrastructures, especially those based in HEIs, to interface smoothly with international e-infrastructures such as, pending agreements, via the European Open Science Cloud.

  - Advise relevant authorities of the best ways to ensure a UK regulatory environment that favours international research collaboration.

- **Organisational strategies:** For the research sector, this is about continually developing and aligning their strategies and culture to achieve the aims outlined above according to their particular missions as autonomous and diverse institutions, maintaining compliance with relevant regulatory frameworks, responding to the evolving research agenda, and using data and indicators responsibly, being aware of the incentives and burden they can create. Jisc will:-

  - Investigate the implications of 'industry 4.0' technologies for research and knowledge exchange, and thereby inform university and funder strategies.

- ➢ Prototype, pilot and, if successful, roll out a significant research analytics service that promotes the responsible use of data from a wide range of sources, that enables universities and funders to plan and monitor activities against their diverse missions.

- **Financial sustainability:** For the research sector, this is about protecting the research budget as other financial changes happen in the sector, reducing and sharing costs, attracting investment, diversifying revenue to increase resilience, addressing changing needs for capital/recurrent funding, optimising the ways funding flows through the sector and through HEIs, and defending the dual funding system and the autonomy and flexibility it brings. Jisc will: -

  - ➢ Put in place a wider range of licensing and procurement arrangements that enable universities to avoid / save costs on digital content and resources.

  - ➢ See also above, on 'efficient institutions'.

World-leading research: indicative outcomes		
Priority	**2019-20 outcomes**	**2021-22 outcomes (Subject to funding)**
National bibliographic knowledgebase take-up		- 200 members (24 libraries/research institutes in Scotland) using service by 2020-21 and demonstrable impact on library strategies at a national scale by 2021-22
Open Research Hub	- Open Research Hub service used by 25 HE members (3 in Scotland) - Maintain current depth of participation and leadership of Jisc in European open access, in spite of Brexit.	
Research skills digital capability service		- Increased numbers of university groups and research groups using the Jisc research digital capability service by 2021-22

How will this benefit Scottish institutions?

Libraries

59. Jisc will save Scottish institutions time and money in the licensing, acquisition and service provision of electronic resources, systems and software for research (and teaching and learning).

60. The **National bibliographic knowledgebase** will be a transformative new service that will aggregate bibliographic data at scale and link with a number of other data sources to help users to more effectively find, access and use print and digital scholarly resources. Over 60 libraries including at the University of Edinburgh are involved in the Beta project to date. By increasing participation in this initiative, it will greatly enhance the ability of libraries to more effectively manage and develop their collections. Working at a much greater scale than existing services, it will draw on more diverse data sources, offer more functionality and provide greater flexibility for libraries and their users.

Research excellence

61. Jisc will commit to maintaining the current depth of participation and leadership of Jisc in European open access, in spite of Brexit. This will be involvement with initiatives such as Plan S, to ensure that Scottish universities are not unduly disadvantaged by Brexit.

62. God open scholarship practice requires universities to make sure their digital research outputs are managed, preserved and accessible. In response to this we developed open research hub, a fully-managed and interoperable research data platform that specifically meets the needs of UK HEIs. Built in partnership with the UK research sector, we will aim for at least three of Scotland's universities to join open research hub. They will benefit from being able to manage all of their digital research outputs in one place, comply with funder policy and receive support for good research practice and the open scholarship (FAIR) agenda.

Expertise needed and developed by research sector

63. Jisc's proposed digital capabilities service for researchers will support:

   - Research excellence and integrity, by building capability in the responsible and effective use of digital technologies for research and research management.

   - Research impact and knowledge exchange, by ensuring that both researchers and research professionals can use digital channels to reach and assess non-academic audiences.

   - International collaboration, by making UK research staff highly skilled and attractive collaborators.

   - Development of advice and guidance and training for digital research.

Greater innovation in the economy

Context

64. Scotland's Digital Future places Scotland at the forefront of the digital economy, with colleges and universities playing a vital role in stimulating and supporting a world leading digital economy through the exchange of research, development and knowledge with business and industry. Universities in Scotland are engaging widely with partners across business and other sectors and Jisc is supporting this. For example, the Janet Network is facilitating research collaboration between scientists from the University of Glasgow and CERN's Large Hadron Collider and the University of Aberdeen is the first university to offer Govroam as a 'visited-only' internet service to support its interactions with other public sector entities. There are many more ways technology may facilitate knowledge exchange and greater innovation in the economy.

65. Both Working collaboratively for a Better Scotland and the UK industrial strategy place an emphasis on future skills needs. Changes in technologies and the effects of Brexit on exports and the flow of migrant workers will affect the demand for and supply of labour. Universities and colleges are making inroads into improving learners' employability skills, particularly in relation to technical and digital skills.

66. Given that the UK has pledged to step up by setting an ambitious target to become the most innovative country in the world and increase its total R&D expenditure to 2.4% of gross domestic product (GDP) by 2027, its talented researchers will need to be linked with industry partners and the right infrastructure if the UK is to attract international investment in UK R&D.

Digital skills

Edinburgh and Heriot-Watt Universities are collaborating to tackle the digital skill shortage while City of Glasgow college has an initiative to tackle the skills gap in the construction industry. There have also been innovative uses of AR/VR technology to address this challenge but clearly more can be done, particularly in light of fierce competition from the private sector with

provision such as Google Digital Garage and even from less obviously digitally focused industries, such as the banking industry, with examples like Barclays Digital Confidence initiative.

What Jisc already does

- Provides high bandwidth, reliable connectivity to those organisations (science parks, local authorities, businesses, NHS, Catapults, etc.) collaborating with our members.

- Offers access to a range of digital solutions such as Govroam – a federated roaming internet service providing secure access across buildings for members of the UK public sector.

- With Digital Catapult, we run an IoT competition to raise awareness of the potential of long range wide area network (LoRaWAN) technology in tertiary education. This is a type of wireless network which allows connected devices such as sensors and vehicles equipment to communicate small amounts of data over large distances using tiny amounts of power.

- Offers interconnectivity to some DCMS 5G testbed trials taking place at our member universities. These trials are exploring the benefits and challenges of deploying 5G technologies in order to create new opportunities for businesses, developing capability and skills and encouraging inward investment in a university context. For example, a 5G and internet of things project in Worcester involves Malvern Hills Science Park, the Local Enterprise Partnership, Worcester County Council, Mazak, Bosch, and QinetiQ.

- Investment in the Placer app, helping graduates bridge the gap between study and employment. In 2019, it was nominated for the UK Top 100 Social Entrepreneur Index.

What will Jisc have done in 3 years' time?

➢ Explore where to best target our enterprise services (offering connectivity (e.g. Janet and Govroam), security, trust and identity, cloud and data analytics services) in order to benefit our members' collaborations, including a regional focus on Scotland.

➢ Further develop Govroam and increase its footprint across Scotland and the rest of the UK. To help prepare for this, we have persuaded SWAN, the Scottish Wide Area Network, to subscribe to Govroam, and they are working through a programme of deployment to their member organisations.

➢ Complete the ten IoT pilots.

➢ Continue to track developments around 5G (and the future applications that a higher capacity mobile infrastructure will enable – and the implications of this for fixed networks).

➢ Develop future skills needs by increasing take up of our digital capabilities service, and creating a bespoke offer for researchers and research staff.

How will this benefit Scottish institutions?

67. We are open to enterprise business with customers who share our values – such as not-for-profits, public bodies and research-linked enterprises and have therefore commissioned research to help us help us focus on where we can most usefully focus our enterprise efforts. Any profits that we make will be reinvested back into Jisc and the Janet Network – helping to sustain the membership benefits we provide. This will help us to:

- Invest in our range of member services

- Continue to champion digital technologies in UK education and research

- Help the sector stay ahead of future trends.

68. Our IoT programme will make it easier for universities and colleges in Scotland to set up and use IoT technology as a solution to various challenges. Some of our members already use IoT in libraries and for managing the campus, but we are encouraging them to go further as part of our Education 4.0 vision for a campus experience that prepares students for the fourth industrial revolution and beyond. We are also expecting to see various efficiency benefits for institutions developing an intelligent campus that responds to human and environmental interactions and adapts to meet students' needs.

High quality teaching and learning

Context

69. Various Scottish policies are driving priorities related to teaching and learning including Digital Scotland, which seeks to increase digital participation and use data effectively. Working collaboratively for a Better Scotland prioritises a fast, easy to use, integrated system (digital and non-digital) delivering support, funding and advice to learners, employers and businesses. This will equip the workforce of the future with the data skills necessary to meet the needs of Scotland's growing digital economy. Digital skills apply to almost any career. The UK government digital skills framework broadly defines them as: digital foundation skills, communicating, handling information and content, transacting, problem solving, being safe and legal online. A recent report suggests that the digital skills gap could cost the UK £141bn in GDP growth. Yet the latest Jisc digital experience insights survey reveals that only 41% of students feel prepared for the digital workplace.

70. Institutional outcome agreements, agreed with the SFC, are the main driver for quality and improvement in teaching and learning in Scotland. Further, the national programme of Enhancement Themes led by the Scottish Higher Education Enhancement Committee, and managed by QAA Scotland, aims to improve the learning experience of students studying within the Scottish HE sector through exploration of themes such as learning analytics, among others.

What Jisc already does

71. We support our member institutions with the digital tools and mechanisms needed for digital to be at the forefront of addressing new opportunities and challenges. This includes:-

- Network and network services for varying types of provision. For example, the Janet network allows for flexible online learning for those who may live in remote locations, or work on shift patterns.

- Access to thousands of resources to use within learning and research environments - from e-books to images, journals to maps. These offer substantial savings through Jisc's group purchasing scheme.

- Access to self-service guidance, tools and resources across a range of priority areas including about strategy and business process, infrastructure and digital practice.

- Direct access to a team of experienced specialists who can offer the guidance needed to help move organisations forward to meet their goals.

- Reduced 'member only' price rates for onsite and bespoke consultancy support.

- Access to an annual series of edtech challenges for students and staff that includes both ideas competitions and hackathons. Also, access to a start-up assessment programme to help institutions to engage confidently with EdTech start-ups.

- Thought leadership including our 'Education 4.0' campaign looking at, for example, the FE College of the future and the student of the future, an annual Horizon report and appearances at education sector events and select committees.

- Access to high quality information and resources for designing effective and engaging technology enhanced learning experiences from our digital experience insights and building digital capability services. While these are (or in the case of Insights for FE, will be) paid-for services, there are plenty of opportunities to access free resources and contribute to, and influence, the creation of related tools and resources which can improve practice across the sector. Examples include:

  i. High quality data and evidence e.g. The 2018 Insights survey reports**:**

     a. Findings from students in UK further and higher education (pdf)

     b. Findings from the pilot of teaching staff in UK further and higher education

     c. Findings from students in Australian and New Zealand higher education

     d. Exploring the student digital experience: student, staff and organisational factors

     e. Using persona analysis to compare student social behaviours with institutional digital provision: a pilot study

     f. Senior leader briefings for further education and higher education.

  ii. Tools for staff:

     a. Building digital capability: The taster version of the discovery tool for staff

     b. Jisc NUS roadmap for supporting students to improve their digital experience at university and college benchmarking tool.

  iii. Events (e.g. Digifest and stakeholder forum).

  iv. Access to communities of practice (e.g. student experience expert group and building digital capability community of practice) offering the chance to exchange ideas, solutions and stories with colleagues from other organisations facing the same challenges.

- Similar opportunities are available for institutions through our learning analytics and Analytics Labs services, which help institutions to make evidence-based decisions and address their strategic challenges and goals. The latter service is also a CPD offering, allowing participants to develop their competencies in data manipulation and visualisation. Regardless of whether they subscribe to these services, institutions in Scotland benefit from:

  ➢ Advice and guidance via account managers, publications, blogs and the Jisc web-site. In addition, a senior learning analytics consultant based in Scotland is focussed on uptake of the service in Scottish HE.

  ➢ Network events/communities of practice.

  ➢ Opportunities to pilot and evaluate emerging / additional services and products.

What will Jisc have done in 3 years' time?

72. **Jisc's vision for learning, teaching and student experience in higher education:** for Scotland's HEIs to be world leading in digital innovation, and for digital to be at the forefront of addressing new opportunities and challenges. Similarly, our **vision for colleges in Scotland** is for all of the colleges to be digital by default in five years or heading seriously in this direction. The three

priorities for Scottish colleges are: 1) quality of provision, 2) sector transformation and 3) employer-led training.

73. Over the next 3 years, we will:-

   ➢ Deliver a national learning analytics service that is having a demonstrable impact on retention and attainment. We will increase the uptake of this service within HE and deliver an equivalent service for colleges.

   ➢ Develop and launch well-being analytics service comprising a high quality collection of content, apps and services that university and college professional staff can use to support students' well-being. We will explore whether a data trust can be used to enable multiple organisations to share data relating to student well-being in a way that is ethical and trusted by students. While this work will eventually become a paid-for service, core funding will ensure access to related advice and guidance such as this recent guidance around the legal and ethical issues of well-being analytics and its implementation. Core funding will also ensure access to communities of practice such as the learning analytics research group.

   ➢ Develop and launch an analytics service for curriculum effectiveness.

   ➢ Develop and launch an analytics service for employability.

   ➢ Continue to negotiate/renegotiate journals and other digital content for the UK education and research communities. This includes developing new content for vocational learning (mapped to SVQ and NOS in Scotland) particularly for Digital, IT and construction, for which there are chronic skills shortages.

   ➢ Relicense e-Books for further education.

   ➢ Continue to negotiate model and approach for licensing of e-Textbooks and produce three e-Textbooks.

   ➢ Increase use of Citizen Maths (aimed at Level 5 in Scotland), a free online course that teaches practical understanding of key maths concepts. Anyone who goes to university is expected to have these qualifications, but Jisc's target is specifically to support FE learners who are not maths-confident.

   ➢ Increase uptake of our digital capabilities service, which will help students develop digital skills and prepare them for the workplace of the future, as well as help staff understand why digital capability matters.

   ➢ Develop new artificial intelligence (AI) technology relevant to our existing services, such as learning analytics. AI can help to analyse data and allow us to better understand students, and well-designed AI that uses machine-learning improves the more it supports learners.

   ➢ Explore the potential of virtual reality (VR) and augmented reality (AR) technology to improve employability skills particularly in vocational areas. With these technologies, cohorts of students can collaborate on real-world or employer led relevant tasks, or use online simulations or virtual reality to provide practice in simulated employment-like environment.

   ➢ Continue to work with universities and colleges, through the Sticky Campus Roadshow and other projects, to create environments that provide students with collaborative learning facilities for both taught sessions and self-directed study. Offering cutting edge campus facilities and infrastructure such as this has obvious appeal to prospective students.

   ➢ Continue to build our services supporting the development and showcasing of student digital capability, which will also support student's progress into employment. We will build on our partnership work with HESA and HECSU in the data space to develop systems which support students to map career paths, evidence their qualifications, engage with employers and find

placements and employment. We will continue to develop prototype Analytics Labs dashboards exploring career planning and employability.

➢ Scotland's College and University Sector ICT strategy seeks to 'promote the use of common data standards to improve the portability of student information' (paras 27- 30). Jisc contributes to this by having representation on the Data Futures programme board (together with SFC) looking at common data standards across UK HE. The notion of a lifelong learning record sits well within our vision for Education 4.0 and we will look for opportunities for work in this area.

➢ As part of our EdTech launchpad, we will develop 'EdTech badges', which are frameworks for issuing digital credentials to students that acknowledge that they have learned something or developed a particular skill.

High quality teaching and learning: indicative outcomes

Priority	2019-20 outcomes	2021-22 outcomes (Subject to funding)
Building digital capability service	- 38 HE members (5 in Scotland) and 18 FE members (2 in Scotland) to take-up the service - Targeted promotion by Account Managers - Community of practice event at University of Edinburgh November 2019	- 67 HE members (8 in Scotland) and 33 FE members (3 in Scotland) to take-up the service
Well-being analytics Curriculum analytics		- Launch well-being analytics service and curriculum analytics service
Digital experience Insights	- Survey completed with a minimum return of 45,000 student, staff and professional services participants (5,000 in HE/FE Scotland) from 90 institutions (15 HE/FE in Scotland) with targeted promotion by Jisc Scotland Account Managers - Community of practice event to be held in Scotland	- Survey completed with a minimum return of 60,000 student, staff and professional services participants (10,000 in HE/FE Scotland) from 120 institutions (20 HE/FE in Scotland) with targeted promotion by Jisc Scotland Account Managers

How will this benefit Scottish institutions?

74. By increasing the number of Scottish institutions subscribed to our building digital capabilities service, we will enable Scotland's universities and colleges to:

- Enrich students' experiences and boost their chances of success in the jobs market by developing their digital skills.

- Support digital leaders and equip them to plan an effective digital transformation.

- Help staff understand why digital capability matters.

- Benchmark progress against peer organisations.

75. By developing and launching a well-being analytics service, there is an opportunity to improve the efficacy of interventions addressing mental health issues. The service will work across institutional boundaries, integrating academic and professional services with data from, for example, independent providers of student accommodation. A number of well-respected studies have now demonstrated the importance and benefits of early interventions to address mental health issues. These show that a comparatively modest allocation of resources to address mental health issues manifested by young adults significantly decreases later morbidity and reduces expenditure on far more expensive health requirements[5].

76. While most learning analytics projects focus on improving student success, the rich data sources increasingly available to us can also be used to gain insight into the effectiveness of the curriculum. This is a relatively unexploited area which has the potential to significantly enhance our understanding of how to create engaging and effective curricula – to find out what is and isn't working for students. Other anticipated benefits include:

- Improving NSS scores by correlating low scores with module design elements – in order to identify common themes.

- Clear oversight of quality assurance programmes and their outcomes – in order to focus resource and identify problems.

- For Heads of Schools, to clearly see how resources are used / allocated – in order to make adjustments to improve efficiency.

77. Increased participation in our digital experience Insights service will ensure that more Scottish institutions are able to make better decisions, enabling staff to:

- Plan digital transformation.

- Improve students' attainment and employability.

- Realise the return on their investment in digital.

- Track progress and benchmark their organisation against others nationally.

- Demonstrate enhanced levels of student engagement.

- Join a community of practice with online and face to face activities to support sharing of practice, and identify and understand unique trends in Scotland and in the UK.

78. We will bring improvements to the current edtech market by developing relationships with companies in the early stages of technology development, steering them in the direction of meeting the needs of HE and FE. In this way, we can mitigate some of the risk that Jisc members face in buying new products from start-ups by health checking them thoroughly. We will also connect suppliers and customers in the market.

Jisc to operate at high standards of efficiency and effectiveness

Context

79. The SFC strategic framework 2019-22 aims to make Scotland's universities and colleges systems successful, world-leading, coherent and sustainable. They will also be making best use of their resources. By subscribing to Jisc, and/or using its services, institutions will be in a better position to achieve this. However, we can only rely on institutional membership if we can prove that we are operating to the highest possible standards, that we are delivering the products our members

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[5] Student Well-being and mental health: the opportunities in learning analytics, Jisc, 2018

want and need together with high satisfaction. Our members will also expect us to share services with other sector bodies, reducing duplication of effort and expense.

What Jisc already does:

- We regularly review our [HE core subscription](#) and [product/service portfolio](#).

- We maintain ISO accreditation for information security management and quality management system for our key services.

- We conduct an annual HE and FE leaders' survey annually measure the satisfaction of our members

- We are part of the M5 Group of services, sharing back office systems and premises with other HE sector organisations.

What will Jisc have done in 3 years' time?

- ➤ Maintain 100% HE membership subscription in Scotland.

- ➤ Conduct a full and comprehensive review of Jisc products and services including mitigation strategy and policy approach.

- ➤ Increase sales of non-core services to members.

- ➤ Achieve full implementation of a GDPR risk framework into our contractual arrangements.

- ➤ All key Jisc services will be compliant with ISO27001 and all key Jisc-wide processes complaint with ISO9001.

- ➤ Aim for a % annual improvement of Jisc member satisfaction (using established baseline perception).

How will this benefit Scottish institutions?

80. By being a more efficient and effective organisation, we will save our members time and money, deliver the products that they want and need, and build a sustainable business model that relies less on central funding and successfully creates income from other sources, and without compromising our offer to our core membership of HE and FE.

Savings, efficiencies and value

What Jisc already does

81. We calculate each year the direct cost savings and staff efficiencies (time savings) that our university and college members in Scotland (and in the UK) achieve through their actual use of Jisc services. We also calculate a value figure that demonstrates the difference between the real commercial price of services we provide to our members that, based on their feedback, they would be unlikely or unable to purchase out of their current budgets. We only calculate savings, efficiencies or value for a service when is can be reliably evidenced and backed-up.

What will Jisc have done in 3 years' time?

- ➤ It is predicted that through generating new and enhanced services for members, the totals will increase by at least 20%:

  - ○ The majority of this growth is likely to be in the 'Value' area, particularly due to our merger with Eduserv and the value reporting of their former services being incorporated into Jisc's own offering.

  - ○ Refining our methodologies will also have some impact on the total we report.

- ➢ We will increase the number of services we report savings, efficiencies or value for, and will continue to refine the existing methodologies. This will involve working closely with our members to understand what they want to see and what helps them demonstrate the value and impact Jisc has.

  - ○ Future total will also include services currently in our R&D pipeline.

- ➢ As more of our services move to a subscription-based model (e.g. FE in England) we will ensure that any future totals will reflect the costs that individual institutions are paying to Jisc.

Jisc
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