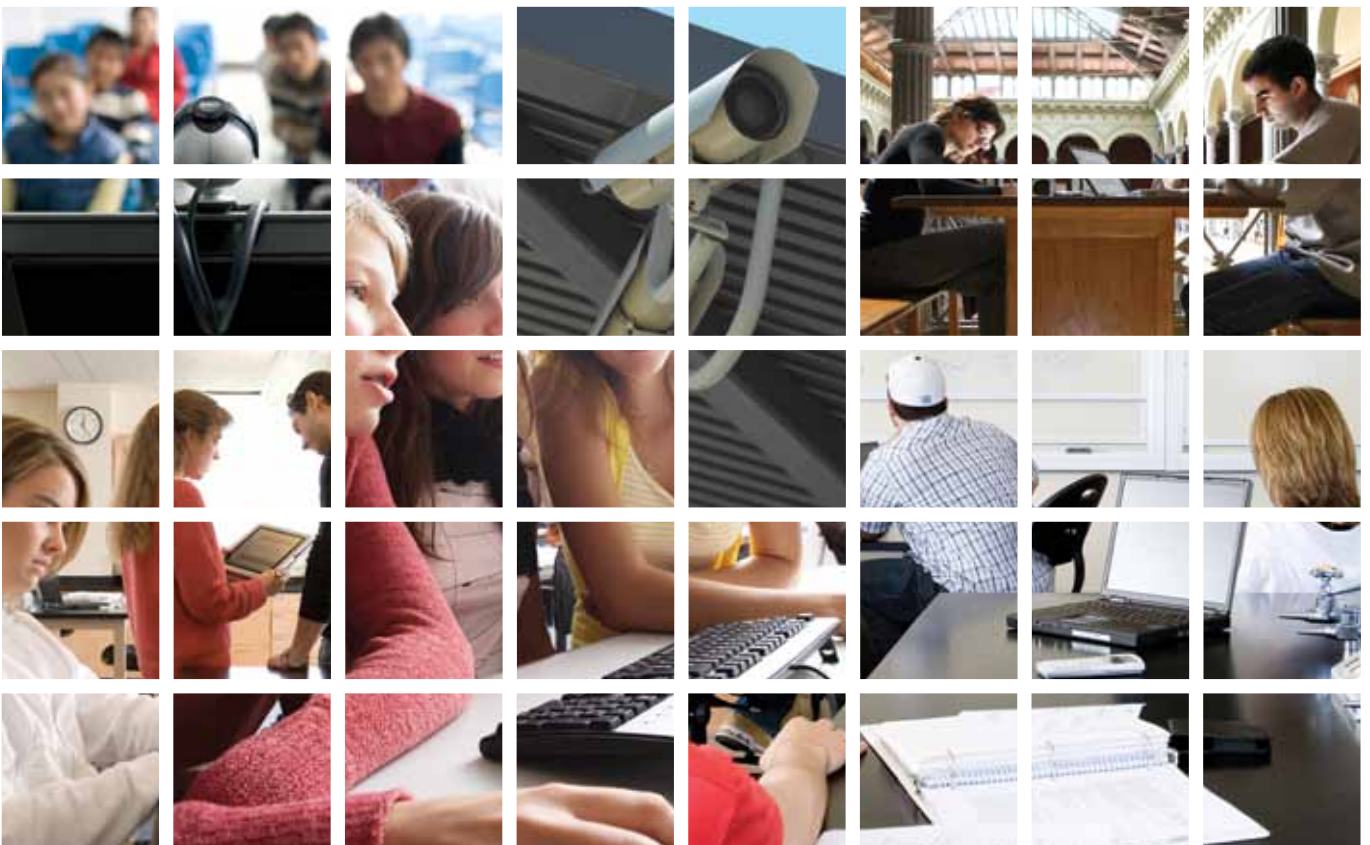
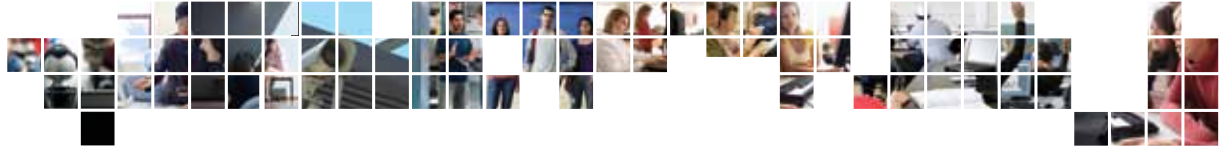




Business Framework for Higher Education

Part One: Cisco Network Architecture





Foreword

Learning is changing at every level, with rapid advances in technology helping to drive those changes. Students expect greater personalisation and more flexible access to course materials. Staff and students expect to access their university or college's facilities wherever they may be working – from within the United Kingdom to a U.K.-partnered university in Asia.

But new technology offers more than a better student experience. It can improve efficiency at a time of financial constraints, help meet targets for reducing energy use, and support global research partnerships. Greater innovation can complement improved productivity.

In this new Learning Society, Cisco is more than just another IT company. It provides complete business transformation solutions for universities, colleges, and schools across the world. We are keen to work not just with IT departments, but with leaders at every level to help to maximise business and development plans. Cisco draws on a philosophy that recognises the changing nature of learning and changing expectations from learners.

All of this is enabled by Cisco's innovative solutions. Using virtualisation - with cloud-based, secure data storage and a single system linking all parts of a university or college's business - Cisco help institutions to improve efficiency and effectiveness. We support collaboration-meetings across several settings, sharing resources in real time, reaching joint solutions - through our innovative, high-definition video and integrated communications technologies. Cisco also enables borderless networks, so that staff and students can connect to information and learning content anywhere, anytime, and using any device from a phone to a PC.

This report offers an overview of the challenges facing further and higher education today, and explains how Cisco can help transform universities and colleges in everything from teaching and learning to estate management. We offer a sample of case studies from the educational institutions we work with.

If you would like to learn more about how we can improve the experience for students at your university or college, and help improve your efficiency, security, or carbon footprint, please contact your Cisco account manager.

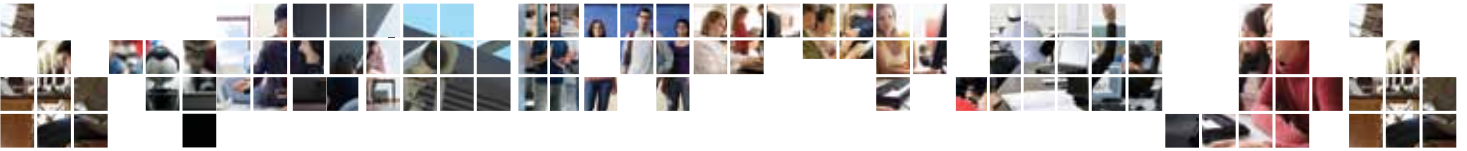


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1. Further and Higher Education Today: Critical Developments

The Facts and Figures

The United Kingdom has 116 universities and other higher education institutions, including world-class research-intensive universities, newer teaching universities and those that seek to combine both strengths, together with specialist institutes in the arts and other fields. Together, they employ 175,000 academic staff and educate 2.3 million full and part-time students, including 500,000 postgraduates. U.K. universities are big business, with multimillion pound budgets and complex business operations. They are also a major contributor to the economy: U.K. universities generate over £59 billion of output, and an estimated 2.6 percent of all full-time U.K. jobs¹.

There are 425 further education (FE), specialist FE, and sixth form colleges in the U.K., including 352 in England. They educate around 5 million people every year on full and part-time courses, including nearly two-thirds of young people over the age of 16 and 172,000 higher education students. Almost half of all vocational qualifications are awarded through colleges².

Trends in Higher Education

Higher education is changing. The population of students is increasingly diverse, with a growing number of mature and part-time students. The U.K. increasingly competes in the international student market, with an increasing number of students from Asia and elsewhere in Europe. The nature of courses is changing too: universities increasingly develop customised courses with industry, including two-year foundation degree courses.



Meanwhile, the expanding student population is expected to contribute more towards the cost of going to university. English undergraduates already contribute £3290 towards their annual tuition fees, often through loans repaid after graduation. An independent review of student finance chaired by Lord Browne is considering whether this cap on fees should be lifted.

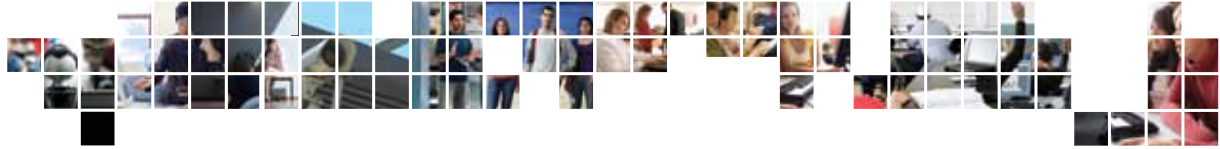
The introduction of fees has done nothing to stem student demand, which has significantly outstripped funded places in 2010. At the same time, students are more demanding about what they receive from universities, both in terms of their education and the services on offer.

The U.K. is at the forefront of international research, with the most productive research base among the G8 group of leading industrialised nations. Universities receive a proportion of their £6 billion research funding on the basis of competitive, peer-reviewed quality assessment: a new Research Excellence Framework is likely to credit the wider impact of research as well as its quality³. U.K. researchers are responsible for 14 percent of cited papers

¹ Universities UK evidence to Independent Review of Funding and Student Finance (2010)

² College Key Facts (Association of Colleges, 2009)

³ www.hefce.ac.uk/research/ref/



internationally, and U.K. universities increasingly commercialise research in health, energy, information and communication technologies (ICT), nano- and biotechnology, materials science, and environmental science, with hundreds of innovative companies generated out of research every year⁴.

Universities have been improving their facilities and reducing their environmental impact in recent years. Energy efficiency has been an important part of many new buildings. The sector has been set targets to reduce scope 1 and 2 CO2 emissions by 80 per cent by 2050 and by at least 34 per cent by 2020, against the 1990 baseline. Each institution is expected to play its part in reducing the sector’s environmental impact⁵.

After a decade of growth in government funding for teaching and research, U.K. universities are increasingly expected to make efficiencies like other parts of the public sector. The June 2010 Budget suggested that efficiencies of as much as 25 percent could be expected in non protected government departments over the next four years. Some initial spending cuts were announced by the last government in 2009. Further efficiencies are expected in the 2010 spending review.

Trends in Further Education and Skills Development

Colleges are vital to their local economies and communities in many ways. They are significant businesses in their own right, employing, educating, and training thousands of people. They are a successful part of a competitive adult skills market, where they work in both competition and partnership with thousands of independent learning providers.

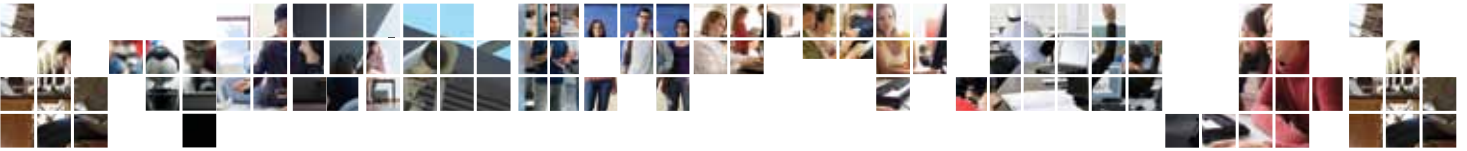
The further education sector has seen improved success rates in recent years, with more students gaining full qualifications. Colleges have become more responsive to younger students, with the development of customised courses for 14 to 16 year olds, dedicated sixth form centres in general FE colleges, and strong pastoral systems. They have become more attuned to the needs of individual employers, developing tailored courses, sometimes delivered onsite and in their wider communities. There are also over 400 private, not-for profit, and voluntary training providers offering adult-skills courses. Additionally, new national skills academies and university technical colleges are being developed, often in partnership with existing providers.



Colleges have been expected to focus in recent years on increasing the numbers of people with qualifications, from basic literacy and numeracy through to professional and trade qualifications at levels 3 and 4. More recently, policy has focused on the development of a “technician class” and a growth in apprenticeships. The previous government set a target that 75 percent of young people should go to university, gain an apprenticeship, or have an equivalent

⁴ Higher Ambitions (BIS, 2009)

⁵ HEFCE news release, 28 January 2010.



technician-class qualification by the age of 30⁶. The new government has announced that it will reduce the regulatory requirements for colleges, including freeing outstanding institutions from the need for Ofsted inspections⁷.

Because of the broad range of students they educate, colleges face a complex regulatory and funding environment, responding to agendas set by several government departments and funded currently by two national agencies. Local authorities have also been given a strategic role in commissioning provision for young people.

Colleges offer a wide range of vocational, applied, and academic courses. New qualifications and a new credit framework have emerged. The college diploma will be available in 14 subjects from business to engineering, and from IT to hair and beauty, starting in September 2010. A mix of practical and academic content, the diploma is designed at three levels of ability. Colleges have played an important role in developing and delivering the diploma. The new coalition government has abandoned plans for academic diplomas; it is encouraging wider academic qualifications such as the IGCSE and is keen to see more job-linked or apprenticeship courses for young people. A new Qualifications and Credit Framework has been introduced to make progression easier for students.

IMPROVING QUALIFICATIONS FOR YOUNG PEOPLE AT SUFFOLK NEW COLLEGE

Suffolk New College is using Cisco qualifications linked with the Cisco® Networking Academy® to improve the IT skills of young people on its new Ipswich campus. The further education college is offering a Cisco unit as part of the new IT diploma and is working with Birmingham City University to provide a wider range of IT qualifications for learners of all ages based on Cisco standards. New IT professional apprenticeships are being developed to NVQ standard to enable people to access work in the small, IT-based businesses that are an important feature of East Anglian employment. The new buildings and infrastructure allow the college to make the most of such opportunities. "We have had a very positive reaction from local employers," says Principal Dave Muller. "And we have welcomed the opportunity to work with Cisco, a world-class company in delivering these qualifications."

Further education has benefited from increased funding over the last decade, and many colleges have had new buildings and more IT-ready infrastructure. However, problems with the school building programme in 2009 left many colleges disappointed, though recent announcements have provided some additional capital funds⁸. Further education has had to make significant efficiencies more recently, which have particularly affected adult courses not linked to specific qualifications⁹. In addition, the 2010 Spending Review announced that universities in England are to face a 40% cut to their overall resource budgets, with further education also taking a 25% cut.

Challenges Facing the Two Sectors

Education and skills are vital ingredients for U.K. competitiveness in a world that is increasingly better educated. Countries like China, India, and Brazil are changing the global economic dynamic, requiring European economies to respond with a focus on better skills in their populations.

The nature of work is also changing, driven by rapidly changing technologies and the growth of service and creative industries. In the last decade, traditional jobs from telephonists to shopkeepers have declined as the demand for paraprofessionals in law, education, and health has grown along with new demand for environmental and leisure industry workers. The qualifications of the old jobs at level 2 have been replaced by an expectation that applicants in the new growth industries have level 3 or level 4 qualifications¹⁰. However, cutbacks in the public sector may change these trends further in the years ahead, although the demand for higher levels of qualification is unlikely to dissipate.

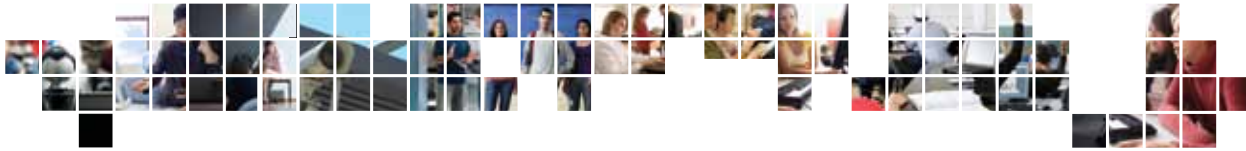
6 Skills for Growth (BIS, 2009)

7 BIS news release, 17 June 2010.

8 BIS news release, 21 June 2010

9 NIACE news release, 4 February 2010

10 Skills for Jobs: Today and Tomorrow (UK Commission for Employment and Skills, 2010)



New technologies are starting to change the way universities and colleges work. Individual institutions are introducing distance learning for some of their courses, a trend that is likely to grow with more advanced technologies. Researchers are finding that Internet technologies enable international collaboration and multinational solutions. Students who are growing up in a technological lifestyle expect a more interactive approach to course materials and lectures.



Expectations of university and college workforces are transforming radically, too. New technologies offer opportunities for a transformation not only in how lecturers and staff relate to students, but also in how they make the most efficient use of their time. They can be a vehicle for workforce transformation.

CASE STUDY: A NEW FACULTY CHANGING BIRMINGHAM'S WAYS OF WORKING

Cisco technology has been central to the development of a new integrated faculty at Birmingham City University. A fifth of the University's 25,000 students are in the new Technology, Engineering and the Environment faculty, which has four schools: Digital Media Technology; Property, Construction and Planning; Engineering, Design and Manufacturing Systems; and Computing, Telecommunications, and Networks.

Cisco technology enables a flow of information across the four schools and to partners across the city, with students using Apple iPhones to connect to all the information they need. WebEx® conferences allow the faculty to manage academics remotely. The technology has also enabled the faculty to support the Birmingham City Council in transforming its urban design and regeneration work. Those working on sites across the city can stay fully connected to colleagues in the main offices. Working with Capita, the university is helping the council to embed new technology throughout new buildings for its design and regeneration staff. Not only are remote staff members easily linked to the centre, but it is also easier to share graphics and photos, solving problems more quickly and saving time and money.

"The Cisco relationship has been massively beneficial to us," says Associate Dean, Dr. Peter Rayson. Cisco's environmental monitoring and virtual network technology has also helped the university to jump 29 places up the Green Universities list and to meet its carbon reduction targets.



Universities and colleges will be expected to become more efficient in their use of financial resources and in the sustainability of their work. The 2010 spending review is likely to require institutions to teach more students with a lower unit resource than in recent years¹¹. The Browne review seems set to raise the cost of tuition to domestic students, which could see demand for shorter degree courses, with more students studying at either local colleges or universities. Restrictions on the growth of private universities are likely to be lifted, allowing new institutions to teach franchised courses closer to where students live¹². Central government funding for capital and research investment is likely to be constrained, although there will be a strong push for innovative research to help drive recovery and growth.

COST-EFFECTIVE SECURITY AT LOUGHBOROUGH UNIVERSITY

Loughborough University's 437-acre campus is relatively crime-free. But after several antisocial incidents and a theft from the university's computer labs, the IT department recognised the need for more video surveillance. Previously, the use of a fibre-optic link to the security gatehouse would have cost £5000 a camera. With Cisco Video Surveillance solutions, the university was able to introduce 25 cameras linked through inexpensive Linux servers to allow any authorised user to select video feeds on any designated computer. The extra security has an added benefit in helping the university meet its security requirements as a team host for the 2012 London Olympics.

Cisco's Vision of a Learning Society

Learning is vital to social and economic progress. Cisco believes that education and technology are life's two great equalisers. They allow a sea-change in the way that people access learning and how it is delivered. With big shifts in the world of work as a result of changing technologies, there is the potential to move decisively from traditional education systems to the "Learning Society."

The Learning Society recognises that facts and knowledge are not enough. People need to learn to think critically, work in teams, and solve problems. As globalisation leads to rapid change, they need adaptable skills; and as people work and live longer, lifelong learning is more important. A Learning Society offers real opportunities in the developing world as well as the developed world.



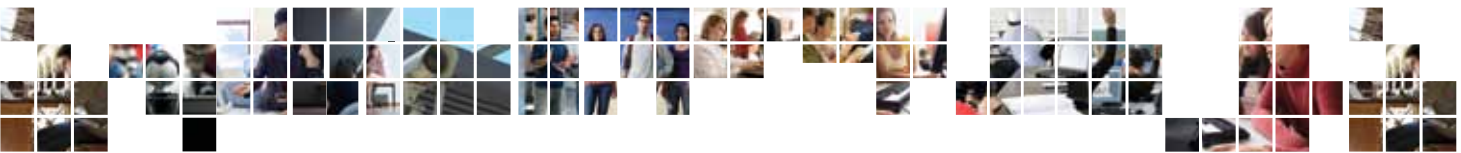
CASE STUDY: STATE-OF-THE-ART LEARNING AT HERTFORD REGIONAL COLLEGE

A £65 million redevelopment of Hertford Regional College using Cisco technologies has transformed learning for the college's 12,000 students and given the college a new competitive edge. The new foundation network provides seamless links between the college's Ware and Broxbourne campuses, with wireless connectivity on both sites. Students benefit from state-of-the-art facilities, including an 18-seat cabin simulator with high-quality streaming videos for training airline staff.

The new technology has produced numerous efficiencies. Staff mobile phones are linked to a Cisco Internet-based phone network, with easy messaging wherever they are located. The college has also greatly improved

¹¹ Guardian, 10 June 2010

¹² Guardian, 9 July 2010



the efficiency of its virtual data storage. Virtualisation alone has saved £320,000 a year in equipment and electricity costs and reduced the college's carbon footprint by 860 tonnes per year. The college is also selling its cloud services to other local schools and colleges. "It all relies on a network that can deliver exceptional performance every time without fail, and Cisco hasn't let us down yet," says Dr Daniel Hidlebaugh, the college's network services manager.

People won't just learn in their own towns or cities, but will share ideas and problems with people elsewhere in their own countries and abroad. Learning will no longer be constrained by the geography of campuses but will be an activity that can be experienced regardless of geography. People's different learning styles will be accommodated, and a broader range of learning providers will provide diverse opportunities to gain new skills. The new learning society will be backed by the right infrastructure and constantly enhanced by continuous innovation and feedback.

This changing world is already having an impact, with the internationalisation of the student market and the growing use of online lecture and course materials. But for this new environment to fulfil its potential, it needs a new mix of public, private and third-sector providers, all able to access a shared learning infrastructure with good connectivity wherever people want to learn. This will mean new ways of working for providers - with common assessment frameworks internationally as well as nationally - and new forms of learner support and funding¹³.

Creating Connected Learning Societies with Cisco

When new technologies were first introduced into U.K. education in the mid-nineties and early 21st century, the vision often exceeded the capabilities of the new equipment. Staff were often lacking in technological confidence. Just as important, low bandwidth meant that video conferencing was often unreal and patchy, while file sharing was frustratingly slow. Those days are over, provided that institutions have the right infrastructure in place.



Advances in technology are helping transform education. Faster broadband speeds, high-definition and 3D imaging, low-cost connectivity, and improving online content are all making a big difference. Cisco is already working with universities and colleges in the U.K. and across the world. Cisco technologies are also used by many U.K. school students. Cisco is also helping JANET—the education and research network connecting U.K. universities, FE colleges, research councils, specialist colleges and adult and community learning providers—to enhance its capabilities using transformative technologies¹⁴.

¹³ The Learning Society (Cisco, 2010)

¹⁴ www.ja.net

The Connected Learning Blueprints

Cisco has created two blueprints for further and higher education. The first covers business and funding issues. The second explains how ICT can transform the operation of universities and colleges¹⁵. Universities and colleges that make the maximum use of the possibilities offered by transformational technology are defined by Cisco as 21st Century Connected Learning Institutions.

The Connected Learning blueprint explains how today's most effective ICT enable more flexible use of space. They maximise teaching, learning, and research opportunities, provide students and staff with a greatly enhanced experience, deliver cost-efficiencies, and help in the achievement of environmental goals. With Cisco, this is more than a technological relationship; it is about meeting wider institutional development and business objectives.



The blueprint sets out three primary areas where ICT links to the operation of universities and colleges:

- **Enhancing the teaching and learning environment** - Teaching and learning models are enhanced by using unified communications and mobility technologies and by enabling virtual classrooms that deliver up-to-date, live remote learning and collaborative workspaces, with secure connectivity throughout the borderless campus. These changes can also help transform workforces, allowing more flexibility, mobility, and information sharing.
- **Workforce enablement** - Workforce enablement is achieved through unified communications, virtual workspaces, and mobility technologies to create new ways of working for back office and front line teaching staff.
- **Flexible workplaces and spaces** - Technology is used to radically change how offices, lecture theatres, assets, and facilities are monitored, managed, and optimised to create the 21st century Connected Learning campus.

The Benefits for Colleges and Universities

The changes outlined in the blueprint can lead to practical improvements in the running of universities and colleges. The benefits include:

- **Making it easier for academic staff and students to work wherever they need to:** The virtualisation of IT (through the use of Wi-Fi and cloud technologies) reduces the need for wiring and for physical spaces for delivering learning. Virtualisation makes it a lot easier to deliver online tutorials, collaborative research, lectures across several settings.
- **Improving the teaching and learning experience:** Lecturers can create, store, and replay course materials from cyberspace, accessing them on any computer anywhere. This can offer students 24-hour access to materials, with online interactive support. New e-assessment technologies can improve teaching practice and student

¹⁵ Technology Framework for Higher & Further Education Part Two: 21st Century Connected Learning Institution Blueprint (Cisco, 2010)

learning.

- **More innovative and timely research:** Project costs and delivery times can be greatly reduced. High-definition online interviews, collaborative experiments across national boundaries, and secure computing and information storage can deliver timely, innovative research and support increasing levels of partnership¹⁶.

CASE STUDY: ENHANCING CAMBRIDGE'S SCIENTIFIC RESEARCH

High Energy Physics research at Cambridge has been enhanced by Cisco technological solutions. Previously, the university's leading physicists would have been based in Switzerland at the European Organisation for Nuclear Research (CERN) - home of the Large Hadron Collider - if they were to provide timely analysis of the data being produced there. Now they can access the petabytes¹⁷ of data speedily and share analysis easily with their Swiss colleagues using Cisco WebEx™ technology. "This capability is essential to keep us at the leading edge of global research," says Dr Ian Lewis, director of the University of Cambridge Computing Service.

Meanwhile, Cambridge biomedical researchers soon expect to be able to study viruses in 3D with fellow researchers in the United States, in real time, allowing antidotes to be developed more quickly. They expect to speed up research into the sequencing of the genome of cancer cells, examining the DNA to gain insights into the pattern of cancer development. Because such research must be collaborative and transnational, it requires transformational technology.

- **A better student experience:** In an increasingly competitive environment, nationally and internationally, students expect flexible learning, easy online access to course materials, tutors, and fellow students, and the chance to learn at times and in places that suit their needs.
- **A better staff experience:** Technologies can improve collaboration, access to information, and working patterns and allow more effective continuity.

Cisco recommends that directorates in universities and colleges focus on enhancing the teaching and learning experience, workforce enablement and flexible workplaces and spaces in creating the 21st Century Connected Learning Institution.

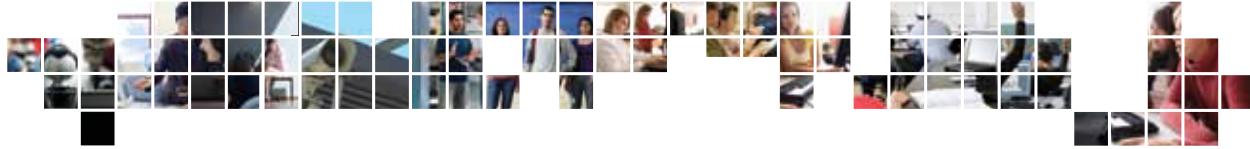
Enhancing the Teaching and Learning Experience

With low-cost netbook computers and 3G mobile devices increasingly common, students have greater opportunities than ever to create, access, and share information online. Universities increasingly expect them to do so. This can improve interactions between students and staff, allowing greater flexibility for both. It can make it easier for students to review lecture or course notes and materials. It can also improve information about timetables, events, and facilities. And where students are doing part of their course overseas, they can keep in touch online.



¹⁶ ibid

¹⁷ A petabyte is equivalent to one million gigabytes or a billion megabytes



This is more than simply a tool for better organisation. Combining voice, video, and messaging services can improve teaching and learning. Multimedia inputs can bring lectures to life at low cost, allowing fuller student interaction. Lectures can easily be recorded and stored, with Internet protocol TV allowing scheduled programming. Students can better balance their work and study. Instead of day release, firms can offer online access. Young people disaffected by traditional school education can be re-engaged through distance learning. Students can automatically be reminded about classes, lectures and tutorials. Materials can be securely stored for future use and tracking.

Cisco solutions are also an important part of the ICT curriculum for schools and colleges, with a growing number taking the Cisco unit in the ICT diploma and other Cisco qualifications, providing students with the skills and experience needed to use ICT in the workplace.

Researchers can benefit from sharing experiments and questions with colleagues and partners overseas in real time, viewing data and working together to find shared solutions. This can greatly reduce the time it takes to achieve scientific breakthroughs and enable collaborative insights in social science or humanities, while allowing academic teams to be based in their home countries.



Workforce Enablement

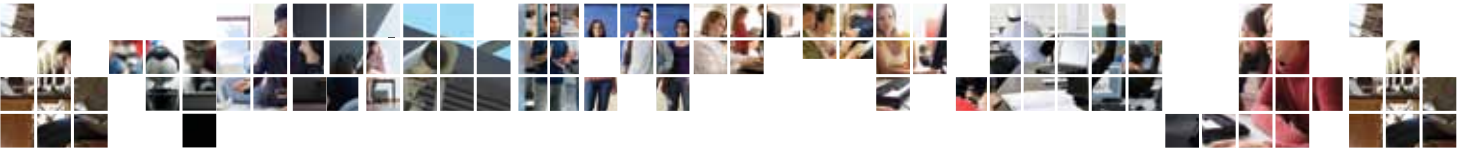
Future financial challenges facing publicly funded bodies will demand substantial efficiencies. Universities and colleges will want to achieve these savings while minimising the impact on the quality of teaching, learning, and research. Cisco technological solutions can allow staff to work remotely while remaining part of the team and fully linked to their university or college.

Unified communications allow all voice, video, and messaging services to be directed to wherever the staff member is working, allowing easy escalation from a message to a video call. Presence services tell the network how best to reach the staff member. Single-number reach can reduce telephone costs. Collaboration technologies, such as Cisco WebEx, can allow joint review of presentations, documents, and spreadsheets online, cutting administration, project, or research time. Cisco TelePresence™ uses high-definition communications and life-size imagery with spatial audio for an immersive experience, reducing the need to travel to meetings whether for business or academic discussions.

All these changes can also play a big part in reducing the carbon footprint of a university or college, as they reduce energy use by maximising building use and cutting travel costs.

Flexible Workplaces and Spaces

With such new technologies, university and colleges can make more effective use of their buildings and estate while controlling energy usage through the use of technologies such as Cisco EnergyWise. More flexible workplaces can involve fewer traditional desks and filing cabinets, with more informal and open-plan work areas, as well as flexible



places where physical meetings, classes, or tutorials are needed. For example, a tutor might meet her students in a Wi-Fi-enabled cafe, with each student using a netbook to review and discuss course materials. IT can also support more effective security using Internet-based video surveillance and better building and energy management.

CASE STUDY: VIRTUAL STUDENTS AT COVENTRY UNIVERSITY

Six thousand of Coventry University's 23,000 full- and part-time students are already based away from the main campus, with 30 partner universities around the world and a new London campus. The university has adopted Cisco technology throughout its operation, and is keen to allow its remote students to have the same experience as those based on campus. "Cisco is a strategic partner in the delivery of all university business, including our trading subsidiaries" says Pro-Vice Chancellor for Business Development, John Latham.

Partnerships with Caterpillar and the AA provide hundreds of students with secure, reliable course materials at their work stations, where they can study for degrees from traditional part-time degrees to master's degrees. Asian students want less expensive U.K. higher education delivered at a campus nearer home. Through partnerships with universities in countries like Malaysia, Coventry uses Cisco technology to provide a full experience to those students.

Two new buildings on campus have been developed with Cisco to provide optimum energy efficiency and security, as well as a great learning environment, which is fully accessible to registered Coventry students wherever they are located in the world. The university is also making increasing use of high-definition video conferencing to reduce its travel budget and carbon footprint.

Delivering the Connected Learning Experience

Universities or colleges need the right ICT infrastructure with campus-wide access to a secure wireless network. They need a system allowing secure and discrete delivery paths for different parts of the institution - teaching, students, research, and administration, as well as paid access for guests and external conference organisers. And they need resilient and robust data centres that provide confidentiality, security, safety, and continuity.

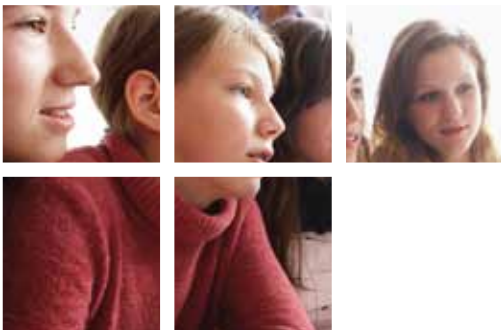
Cisco can provide all these solutions. Working in partnership with leaders throughout universities and colleges, we can transform learning and institutional efficiency, placing institutions at the cutting edge of the 21st century Learning Society. Working with Cisco can improve the business success of universities and colleges, providing a better experience for students and staff. Combining the practical technological support with the know-how already gained from working with many FE and HE leaders, Cisco is well placed to help your university or college meet the demands of today.

Cisco would like to offer you the chance to discuss the ideas and examples in this paper. Get in touch with your local Cisco representative today to start the conversation.





Business Framework for Higher Education



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