Business Case

The School of Computing and Centre for Artificial Intelligence

The following business case has been prepared for the BTVLEP Board, to inform decisions made regarding the bid from the University of Buckingham for the building of a new School of Computing and Centre for Artificial Intelligence. It looks at the case from the following perspectives: *Strategic; Economic; Commercial; Financial and Management*.

This project will complement the existing investment by BTVLEP and its partners in other key research infrastructure for growing sectors of the economy.

Complementary projects providing research facilities include the Silverstone Sports Engineering Hub and the Wescott 5G Step Out Centre. There is great potential for the research facilities to collaborate and deliver programmes that support Buckinghamshire's high growth companies.

1. Strategic Case

The University of Buckingham, under the leadership of Sir Anthony Seldon, is preparing to transform its approach to Artificial Intelligence, Digital and Analytical Skills and Immersive Technologies with the creation of new centres for training and applied research within the School of Computing. These are the drivers of transformative change in the minds and actions of students, businesses and their staff in UK and globally.

This project responds to National Industrial Strategy (NIS) to put UK at the forefront of industries of the future. The project will respond to the first Four Grand Challenges of the NIS:

- **AI and data**: the new Centre for Artificial Intelligence (AI) in the School of Computing will train a new generation of AI and Data Science specialists to fill the increasing demand in the UK for these specialist jobs and drive innovation and economic growth.
- **Ageing Society**: in collaboration with the Schools of Medicine, Dentistry, Psychology and Wellbeing at University of Buckingham, the NHS and the Digital Catapult – and building on existing work with Ten-D Innovations (Shanghai and USA), Imperial College, KU Leuven, the Wellcome Trust Sanger and The Open University – the new Centre for AI will develop applications to deliver automated diagnostics and remote care medical technologies.
- **Clean growth**: building on our work on battery management systems and transport innovation – with a longstanding R&D programme with Ten-D Innovations in Shanghai and USA (which is bringing in £1.7 million foreign direct investment in the first stage) – the Centre will investigate intelligent

ways of using electric vehicles (the battery system) to power homes and businesses leading to new business models.
- **Future of mobility**: in partnership with TenD-Innovations, local authorities and businesses, the new Centre for AI will explore ways to use AI and Data Science to accelerate development of new mobility services, drive efficiency and enable a more effective operation of our transport system.

The project is closely aligned to local priorities and aims realise the visions of Buckinghamshire's Local Industrial Strategy (LIS) and Strategic Growth Corridor. The project will enhance the capabilities of Buckinghamshire's emerging economic islands:

- **The creative and digital economy**: immersive technologies, such as virtual and augmented reality will enable businesses to develop the products, services and consumer experiences of the future. New academic programmes will be offered to train skilled creative innovators to deliver sustainable growth.
- **High-Tech cluster**: collaborative research with high-tech engineering businesses to develop predictive technologies using AI and data science.
- **End-to-End Space Sector**: use Augmented Reality and Virtual Reality technologies to enhance the design process of propulsion systems.
- **Revolutionising Health and Care**: research and develop AI applications to deliver automated diagnostics and remote medical technologies.

The project has six key strategic aims:

1. To equip graduates with specialist digital skills for the Fourth Industrial Revolution by creating a new centres of AI and Immersive Technologies and a teaching centre at the heart of the campus of the University of Buckingham.
2. To train a generation of specialists and doctoral students in artificial intelligence, augmented/virtual reality, computer vision, data science, internet of things, machine learning and mathematics; embedding cultural awareness, ethics, enterprise and leadership skills in all its graduates as core competencies necessary to work in industries of the futures.
3. To nurture the next generation of spin-off companies; commercialising research and innovation and contributing to local and regional economic growth.
4. To support the productivity of Buckinghamshire's priority sectors; exchanging knowledge to support the delivery of Buckinghamshire's LIS.
5. To inspire the next generation, particularly women, to study computing at school and embark on a career in Tech.
6. To share the benefits as widely as possible and generate lasting economic value for Buckinghamshire; helping to make sure that Buckinghamshire can contribute to, as well as benefit from the Cambridge-MK-Oxford Growth Corridor.

2. Economic Case

According to latest data from ONS, the number of unfilled positions in the IT sector last quarter rose by 24%, one of the largest increases of any industry.

AI is an area of explosive growth; IBM reports a 300% growth in investment into AI in one year, with doubling of the number of jobs needed and an indication that 9/10 of Chief Information Officers are looking into Machine Learning.

PWC in its report 'The economic impact of artificial intelligence on the UK economy' estimates that UK GDP will be up to 10.3% higher in 2030 as a result of AI – the equivalent of an additional £232bn – making it one of the biggest commercial opportunities in today's fast-changing economy.

It is essential that Buckinghamshire's high growth companies have the capabilities needed to benefit from this opportunity. There is currently no AI research and innovation, or Immersive Technology facility in Buckinghamshire. This project will provide advice and facilities that enable businesses to collaborate with the University and use AI, Data Science and Immersive Technologies for innovation and business growth. Moreover, the project will deliver highly skilled graduates required by businesses to sustain their growth.

Under the leadership of Dr Harin Sellahewa, the School of Computing has more than doubled its number of undergraduate students in three years – majority of UK students are from the Home Counties. The forecasted turnover of the School for 2019 is approximately £1.7 million – a year-on-year increase of around 35%. The project is expected to increase the University's turnover by an estimated £3 million per annum. The project will be sustained in the long term from tuition fees and research income, grants, donations and foreign direct investment.

The School of Computing has well-established academic staff who are successful in attracting research grants and industry funding.

Over the past five years, the School of Computing has successfully won four KTP (Knowledge Transfer Partnerships) awards (part funded by Innovate UK) and overseas industry funding worth £1.7 million to conduct industry linked research and developments in AI, Agritech, Medical Imaging, Internet of Things and Security.

1. **KTP with Deepnet Security (Bletchley Park)**: a grant of £160,000 was secured in August 2014 by Dr Hisham Al-Assam and Mr Hongbo Du. The project developed a state-of-the-art face recognition component to integrate into the company's multi-factor biometrics-based authentication software. The project transferred specialised knowledge in biometrics-based authentication and security systems accumulated in the School over the last decade to Deepnet Security, who will then deploy cutting-edge authentication technologies in the field.

2. **KTP with Deepnet Security (Bletchley Park)**: a grant of approximately £120,000 was secured by Dr Harin Sellahewa and Dr Hisham Al-Assam in 2015. Through this project Deepnet Security and the School of Computing used their specialised skills and knowledge together to develop an authentication tool based on hand signatures. The project transferred the specialised knowledge of touch-gesture based biometrics authentication and security systems in the Department to Deepnet Security, who will then deploy cutting-edge authentication technologies in the field.

3. **KTP with Russell IPM**: Dr Ihsan Lami and Professor Sabah Jassim secured a KTP grant worth £200,000 in 2015. It will be used to develop a smart-trap with an embedded remote pest-recognition system for pheromone-based insect monitoring traps. This project will join the strengths of both parties; Russell IPM has been at the forefront of developing pheromone-based traps for various farming insects for over 25 years, while the School of Computing has been developing novel image analysis and integrated wireless communication techniques for over 10 years.

4. **KTP with Russell IPM**: This summer, Dr Ihsan Lami and Dr Harin Sellahewa has won a fourth KTP grant with a total of just over £200K over 24 months. This KTP project will focus on the development of low-cost digital solutions for the monitoring of pests using smart pheromone-based trap sensors and their innovative IoT connectivity. The first aim of this KTP is to develop a novel, low cost and low energy hierarchical mesh radio network to collect pest trap data from cities to remote areas to provide key information on the movement and the development of invasive pests. Developing such solutions for a commercial product for specific markets targeting large and varied user groups presents a new and exciting challenge for the academic team at the school.

5. **UB - Ten-D Innovations R&D Centres**: The School have entered into a £1.7 million partnership with Ten-D Innovations (Shanghai) as a gateway to accessing state-of–the-art knowledge and expertise in cutting-edge research. The research partnership with Ten-D Innovations aims to develop technologies to revolutionise electric vehicle industry, design autonomous drones for building inspections and use artificial intelligence to detect anomalies in medical images.

This project will deliver twenty new KTP projects over a 10-year period. It will further strengthen the existing partnership with Ten-D Innovations bringing in foreign direct investment to Buckinghamshire. New degree apprenticeships specialising in AI and Data Science will offered in partnership with businesses and IT industry.

Project Costs

Total Capital Cost of the Project (Expenditure):	
Capital Expenditure	**£**
Design, plan, project management and build costs	£6,000,000.00
TOTAL COST OF PROJECT	£6,000,000.00
Other Capital Funding Secured for the Project (Other Income - excluding any funding that might be forthcoming from the LEP):	
Capital Funding already Secured to the above	**£**
University of Buckingham	£4,000,000.00
Sub-total	£4,000,000.00
Potential Capital Shortfall	£2,000,000.00

Benefits realisation and monitoring plan

Benefit	Target/ deliverable	Timescale/ measurement	Person responsible
Space and physical build	1. 1,500 sq. metre academic building	1. Delivered and fitted out by end March 2021	1. Estates Bursar
Jobs created	2. 60 Construction workers 3. 4 Domestic workers 4. 0.5 Maintenance staff 5. 10 new Lecturers/Researchers 6. 2 new Administrators 7. 1 Outreach and Partnership Coordinator 8. 10 new KTP Associates 9. 100 high value graduate jobs via spin-outs and business growth from 10 KTPs.	2. During build; report from contractors to project board 3. First four years from build completion; HR report 4. From April 2021; report from HR 5. First five years from build; report from HR 6. First five years from build; report from HR 7. First 10 years from build; report from HR 8. From April 2021; report from HR 9. Frist 10 years from build; annual reports from KTPs	2. Estates Bursar 3. HR Manager 4. HR Manager 5. Dean of Computing 6. Dean of Computing 7. Dean of Computing 8. Dean of Computing 9. Head of Alumni/ Dean of Computing
Spin out commercial activities	10. 10 spin-outs	10. First five years from build; Enterprise Hub report	10. Dean of Computing/Enterprise Hub Partnerships Manager
Academic Qualifications	11. Level 3 (Foundation) Students: 20 per year 12. Level 6 (BSc) Students: 175 per year 13. Level 7 (MSc) Students/Apprentices: 80 per year 14. Level 8 (PhD) Students: 35 per year 15. Professional Qualifications/Training: 75 per year	11. From 2023; Annual admissions report 12. From 2023; Annual admissions report 13. From 2023; Annual admissions report 14. From 2022; Annual admissions report 15. From 2022; Annual admissions report	11. Director of Admissions 12. Director of Admissions 13. Director of Admissions 14. Director of Admissions 15. Director of Admissions
Knowledge Transfer Partnerships (KTP)	16. KTP contracts: 2 new KTPs per year; each worth £125K	16. From 2021; Annual report	16. Dean of Computing and Finance Director
Publications	17. Peer-reviewed Publications: 30 per year 18. Book chapters: 2 per year	17. From 2021; Audit by Dean of Computing 18. From 2021: Audit by Dean of Computing	17. Research Officer in Computing 18. Research Officer in Computing
Public engagement	19. 6 events per year reaching direct audience of 500 per year (AI festival)	19. Annual report from marketing team	19. Director of Marketing
Outreach	20. Active programme of events and visits reaching 5000 school pupils per year	20. From 2021; Annual report from School of Computing	20. Outreach and Partnership Coordinator in Computing
Diversity	21. Increase proportion of female undergraduate students to 30% over five years	21. Annual report from Director of Admissions	21. Director of Admissions
Cross ARC Collaboration	22. Active and regular engagement of research collaborators from 8/10 arc universities.	22. Proactive plan and annual reporting	22. Director of Development and Dean of Computing
As a catalyst for inward investment	23. Attracting 1 new major inward investment per annum	23. Running report from SLT	23. Dean of Computing and Director of Development

GVA per head for workers in digital industries in 2014 was estimated as £92,000 a year. If 100 new jobs are created in digital industries as a result of this project the total annual additional GVA is £9,200,000.

The project will lead to the creation of 10 new lecturer posts. As a comparison the GVA per staff member at Exeter University is £70,425 per worker. Therefore it is estimated that the 10 new jobs will generate annual additional GVA of £704,250.

The total annual additional GVA of the project will be £9,904,250.

Unquantified benefits

1. Enhance reputation of the University resulting in attracting more students and high-calibre academic and research staff to Buckingham. Overall enhancement to Buckinghamshire as a place with a top university in the UK with high-quality graduates (people, infrastructure and places).
2. Enhance profile of the University – new academic programmes and research; new partnerships with businesses; spinouts.

Wider Impacts

1. Increased diversity in IT industry.
2. Increase aspirations of young people through outreach activities.
3. A well-informed general public on developments in AI, medical technologies, agriculture technologies, low-carbon living and cyber security.

Monitoring and evaluation

A Project Board (PB) has been established to provide overall direction, monitor and evaluate the project. Chaired by the Dean of Computing, the Board includes the following members of the University: the COO, Director of Finance, Director of Development and the Estates Bursar. The Estate Bursar will provide quarterly reports to the LEP during the project build.

A user group will be established to meet monthly to evaluate the post implementation project outcomes and feeding back to the LEP.

3. Commercial Case

The University has an outstanding record of successfully completing and delivering large scale development projects. Key examples are: 1) Milton Keynes University Hospital Academic Centre (£8M; part funded by SEMLEP); 2) Vinson Building (£6M; part funded by BTVLEP and a private donation); 3) Regeneration of the campus including Prebend House (£1.25M; Grade 2 listed building), Ondaatje Hall (Grade 2* listed building), and social areas for students.

The University has a dedicated development office with an excellent track record in fund raising for buildings, people and scholarships (over £35 million raised in the last three years).

A dedicated project manager will oversee the day-to-day development of the project.

Procurement will be overseen by the Project Board using competitive tendering adhering to University's established procurement policies.

Normal contractual clauses will be included to ensure the university's protection in light of delays or contractual difficulties.

Key milestones and delivery dates

	MILESTONE	DATE
Key Milestones	Anticipated start date	January 2019
	Architectural design complete	April 2019
	Tender process commences	May 2019
	Planning consent received	July 2019
	Construction commences	August 2019
	Ground work complete	December 2019
	Steel work complete	March 2019
	Anticipated practical completion date	December 2020
	Fit out complete	February 2021
	Occupation	March 2021

4. Financial Case

We are seeking £2 million from BTVLEP towards a total cost of £6 million. The University's Council approved the raising of a Bond that includes £4 million matched funding for the project.

Further funding opportunities are explored through donations and industry partnerships.

Total Capital Cost of the Project (Expenditure):	
Capital Expenditure	**£**
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TOTAL COST OF PROJECT	£6,000,000.00
Other Capital Funding Secured for the Project (Other Income - excluding any funding that might be forthcoming from the LEP):	
Capital Funding already Secured to the above	**£**
University of Buckingham	£4,000,000.00
Sub-total	£4,000,000.00
Potential Capital Shortfall	£2,000,000.00

Expenditure Profile:	
Year	**£**
2018-19	£100,000.00
2019-20	£3,000,000.00
2020-21	£2,900,000.00
TOTAL COST OF PROJECT	£6,000,000.00

Forecast Revenue and Savings (Post Works)	
Year	**Forecast Income (£)**
2018-19	£0.00
2019-20	£0.00
2020-21	£22,109,000.00
2021-22	£23,590,000.00
2022-23	£25,042,000.00
2023-24	£26,300,000.00
2024-25	£27,470,000.00
2025-26	£28,393,000.00
2026-27	£29,276,000.00
2027-28	
2028-29	
2029-30	
2030-31	
Total	£182,180,000.00

Cost of Sales (to generate the above income and savings)	
Year	**Cost (£)**
2018-19	£0.00
2019-20	£0.00
2020-21	£0.00
2021-22	£22,148,000.00
2022-23	£22,998,000.00
2023-24	£23,838,000.00
2024-25	£24,723,000.00
2025-26	£25,578,000.00
2026-27	£26,339,000.00
2027-28	
2028-29	
2029-30	
2030-31	
Total	£145,624,000.00

Other funding already secured to generate forecast revenue/savings	
Income Item	**Cost (£)**
2016 - 17	
2017-18	
2018-19	
2019-20	
2020-21	
2021-22	
2022-23	
2023-24	
2024-25	
2025-26	
2026-27	
2027-28	
2028-29	
2029-30	
2030-31	
Sub-total	£0.00
Potential Revenue Funding Shortfall *(NB. The LEP Does not have any revenue to offer in support of any of the above activities at this time. We are merely asking this question to ascertain the likelyhood of the applicant being able to fill the building)*	£145,624,000.00

Sustainability:	The project will be sustained in the long term from tuition fee and research income, grants and donations.

5. Management Case

A Project Board (PB) has been established to provide overall direction, monitor and evaluate the project. Chaired by the Dean of Computing, the Project Board includes the following members of the University: the COO, Director of Finance, Director of Development and the Estates Bursar. A dedicate administrator provides secretarial support to the Board.

All project management issues such as change and risk management will be overseen by PB. The PB reports to Finance, Estates and Resources (FERC, a standing committee of Council). The Estate Bursar will provide quarterly reports to the LEP during the project build.

Academic and research outputs (e.g. new programmes, number of graduates and apprentices, KTP projects) will be overseen by the School Board (a sub-committee of Senate).

Risk Analysis and Mitigation Plan

# (not in rank order)	CATEGORY	RISK	LIKELIHOOD (Score 1-5)*	IMPACT SCORE (Score 1-5)*	RISK OWNER(S)	MITIGATING ACTIONS (not in preference order)	NAMED OWNER OF MITIGATIONS	RESIDUAL LIKELIHOOD (Score 1-5)	RESIDUAL IMPACT (Score 1-5)	INITIAL RISK RATING	RESIDUAL RISK RATING
1	STRATEGIC	Regional and local Industrial strategies are not implemented and there is a collapse in support for AI-related innovation	2	5	SLT	Support the development and steering groups and give public endorsement Build coalition and promote partnership working across the Ox-Cam Arc Universities	AL VC	1	5	(10) Amber	(5) Green
2	FINANCIAL	The matching funding for UB relies on the issue of a bond (agreed and approved by Council). Risk of volatility on the Financial markets bond issue fails	3	5	COO/Finance Director	Launch fundraising strategy and build capacity Make AI a priority of the newly formed Development and Innovations Board Seek industry support and contracts Develop ancillary fundraising strategy Launch bond to market asap (January 2019) Bond allocation signed off by Finance, Estates and Resources Committee, allocating £4m of bond to allow building commission and completion	AL PJ	1	2	(15) Red	(2) Green
3	MANAGEMENT/ ORGANISATIONAL	Lack of project management capacity within university to oversee major build	1	5	Estates Bursar/ project Board	Build on track record of delivering major buildings on time (e.g. Vinson Building, MKUH Academic Centre) Form Project Board involving leadership from figures from all relevant areas of the University	HS CS	1	4	(5) Amber	(4)

4	MANAGEMENT/ ORGANISATIONAL	Planning permissions is denied on desired development site	3	5	Estates Bursar/ project Board	Early consultation with planning has already commenced Examine back up site, on land already held by UB Consult Environmental reports soonest (work already commissioned)	CS	2	5	(15) Red	(10) Amber
5	MANAGEMENT/ ORGANISATIONAL	There are delays in planning and the building is not completely delivered within the timeframe	2	4	Estates Bursar/ project Board	Consult with shortlist of architects and advisers and commence pre planning activity as soon as funding is confirmed in January 2019 Negotiate robust clauses in contract to protect against delays	CS PJ	1	4	(8) Amber	(4) Green
6	MANAGEMENT/ ORGANISATIONAL	Failure to attract sufficient PhDs or students	4	4	Dean of Computing/ Director of Marketing	Build on current healthy growth (in 2018 + 12% last year: doubled since 2015)	HS	2	4	(16) Red	(8) Amber
7	STRATEGIC	The proposed advisory board does not form or perform well	2	4	Dean of Computing	Build on current board members	HS	1	4	(8) Amber	(4) Green
8	STRATEGIC	Brexit erodes charitable giving and impacts the economy so that educational philanthropy declines	3	4	Development team	Continue to cultivate close relationships with major donors 2. Continue to promote the unique selling points of the UoB FERC has allocated remaining £4m of build budget as first call on the bond issue of £25m Robust fundraising plan is ready for implementation	AL AFS	2	4	(12) Amber	(8) Amber

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