Draft extract from the minutes of the meeting of the University Executive Board held on 1 June 2015

Review of the School of Systems Engineering

At its meeting on 9 February 2015 the Board agreed to establish a Review of the School of Systems Engineering (SSE) in response to the School’s performance in the Research Excellence Framework 2014.

The Review Group was asked to determine progress of SSE following the review undertaken in 2009-10, including strategic, academic and financial aspects.

It was noted that the Review Group had considered a number of options for the future of the School. The Review had sought to protect and develop the best aspects of SSE’s existing activity for the benefit of the University as a whole. Four scenarios were proposed:

1) Replace SSE with a School of Computer Science and Electronic Engineering
2) Create a Department of Computer Science and Engineering within the School of Mathematical and Physical Sciences
3) Reduce and distribute SSE activity
4) Disinvest in all SSE activities

Having considered the four scenarios in depth, and taking full account of the information, data and feedback received throughout the Review period, the Review Group recommended that the University Executive Board select scenario 3. It was the considered and unanimous view of the members of the Review Group that this scenario was the best option to maintain and enhance the University’s efficiency, effectiveness and financial viability and, in doing so, protected (as far as is possible) the current and future employment of all categories of University staff.

The reasons for recommending scenario 3 were that it provided a framework for:

- Retaining and strengthening the areas of world-class and impactful research currently in SSE that provided a close fit with the University’s Research Strategy 2020;
- Retaining and strengthening the areas of teaching currently in SSE that were most relevant and attractive to current and future students;
Strengthening the leadership for these areas of research and teaching through the utilization of the effective leadership and efficient structures that were available in other Schools without significantly disrupting the management in any single School;

Placing these areas of research and teaching onto pathways of financial sustainability.

The Review Group did not consider that any other of the scenarios was able to deliver these four outcomes.

The Board agreed the recommendation that scenario 3 be progressed with the caveat that further consideration be given to determining the best organisational location for the Centre for Bio-Engineering for an initial period of no more than five years; Pro-Vice-Chancellor (Professor Van de Noort) was asked to give this matter further consideration.

As the report’s recommendation pointed to a reduction in the number of academic staff (as defined by Statute XXXIII), it be recommended to the Council through the Strategy and Finance Committee that in accordance with the University’s Review and Restructuring Policy, a Restructuring Committee be established with the following membership:

- Lay Member of the Council (Chair)
- One further member of the Council
- One member of the academic staff nominated by the Senate
- Pro-Vice-Chancellor (Professor Van de Noort)
- Dean of the Faculty of Science (Professor Cosh)
- Head of School or office holder of equivalent standing
- The Director of Human Resources or his nominee (Miss R. Thorns)

The Board noted that Statute XXXIII stipulated that no individual who had been identified as being at risk of redundancy might serve and the membership would be varied accordingly by substitution with an office holder of equivalent standing.

The Board agreed that all applicants should be contacted to inform them of the proposed change.

The Board recorded its thanks to all those involved in the Review.
Final Report of the School of Systems Engineering Review Group

Background

1. The University Executive Board (UEB) at its meeting on 9 February 2015 agreed to establish a Review of the School of Systems Engineering (SSE), in response to the School’s performance in the Research Excellence Framework 2014 (REF).

2. The SSE Review Group membership would consist of:

   Professor R Van de Noort, Pro-Vice-Chancellor (Academic Planning & Resource) [Chair]
   Professor D Berry, Dean, Postgraduate Research Studies
   Dr E McCrum, Associate Dean, Teaching and Learning, Faculty of Science
   Dr R Stewart, Director of Planning & Strategy [Secretary]

3. The terms of reference of the Review Group would be:

   - To determine progress of the School following its review in 2009-10, including strategic, academic and financial aspects.
   - To consider the strategic direction of the various elements which comprise the School.
   - To consider whether each such element is best constituted with a School of Systems Engineering, or with a different part of the University, or should not be part of the University at all.
   - To consider the implications for other Schools of moving any elements of Systems Engineering to those other Schools.
   - That the review make recommendations if possible to the University Executive Board at its meeting on 1 June 2015, such than any recommendations the Board may wish to make can be brought through the Strategy and Finance Committee and the Senate to the meeting of the Council on 13 July 2015.
Consultation Process


5. The Review Group has received representation from a range of staff within the University, predominantly from Systems Engineering; from SSE students and alumni; and from members of the School’s Industrial Advisory Board and other employers and industrial partners. These representations have been made through formal meetings with the Review Group, one-to-one meetings with members of the Review Group, and written correspondence and documents. In addition, the Acting Head of School (Professor Becerra) submitted a formal response on behalf of the School’s management team. A full list of meetings, formal submissions and correspondence received by the Chair is listed at Appendix 1. An overview of the views and comments expressed in these representations is given at Appendix 2.

6. The Review Group also considered a large amount of data covering various aspects of the School’s performance, which is listed at Appendix 3.

7. Through these various inputs, the Review Group noted strengths and weaknesses in the School’s current profile, composition and operations, and potential areas for change and development. In this context, and mindful of the initial impetus for the Review, the Group identified the key issues that it sought to resolve and potential options for addressing these, as outlined below.

8. The Chair of the Review Group also made two presentations to the School. In an initial presentation (10 February 2015) he outlined the reasons for the Review, its timetable and method. In a later presentation (29 April 2015) he outlined the four scenarios under consideration and invited further comments ahead of the finalisation of the Group’s report and recommendations to the UEB. The Chair of the Review group also held Q&A sessions with SSE staff and students on 11 March 2015.

9. The Chair of the Review Group met with the President of the Reading branch of the UCU and the Co-chair of the Staff Forum on 29 April 2015 when he outlined the four scenarios under consideration and invited comments ahead of the finalisation of the Group’s report and recommendations to the UEB.

10. The Chair met regularly with the Acting Head of School, and with the Dean of Science, throughout the period of the Review.

Key issues that the Review Group sought to address

11. The Review Group was asked to determine progress of SSE following the School’s review in 2009-10, including strategic, academic and financial aspects. The review of SSE in 2009-10 had been triggered by the disappointing research performance of SSE in RAE 2008, when it had been submitted to the Units of Assessments (UOA) Computer Science and Electrical and Electronic Engineering.
12. It is evident that progress has been made on a number of fronts, and major achievements since the last review include:

- SSE has seen its research grant income grow over the intervening period; SSE contributes currently over £2.5M/year to the University’s research grant income;
- Many new research synergies have been developed in recent years, both within SSE and with other Schools, including the School of Construction Management and Engineering (SCME), the School of Mathematical and Physical Sciences (SMPS), the School of Psychology and Clinical Language Sciences (SPCLS), the School of Chemistry, Food and Pharmacy (SCFP), the Henley Business School (HBS), the School of Agriculture, Policy and Development (SAPD), the School of Archaeology, Geography and Environmental Science (SAGES), the School of Politics, Economics and International Relations (SPEIR) and the School of Arts and Communication Design (SACD); SCME and SAGES have also valued their use of the CAVE facilities (and associated expertise);
- SSE is active in the TSBE (Technologies for Sustainable Built Environments) Centre (based within SCME), supervising several EngD students;
- SSE has increased the number of its PhD students;
- SSE has had a strong involvement with KTP activity: the total value of ongoing KTP projects involving SSE staff exceeds £1M; further KTP projects in development involving SSE staff exceed an additional £1M in value; 40 to 50% of all UoR’s KTP projects involve SSE staff;
- SSE has rationalised its undergraduate offering to just six programmes plus variants since the 2009-10 review; SSE had commenced the process leading to the closure of the BSc IT programme before the start of the Review as part of the ongoing rationalisation programme;
- SSE provides its students with excellent employability prospects, especially for its undergraduate students in Computer Science and IT, and the employability of students is underpinned by effective placements, with 30% of all the placement offers received by UoR from employers targeting students in SSE;
- SSE has played a key role in the development of MOOCs (Massive Open Online Courses) and innovating teaching practices and this is evidenced by a number of University Teaching Fellows and National Teaching Fellows; the ‘flipping the classroom’ concept used in part 1 is evidence of exploiting the technology of MOOCs; furthermore, there are indications that the MOOC Begin Programming: Build your first mobile game, launched in October 2013, contributed to an increase in applications in 2014 of 20.8% (17.4% home/EU; 43% International), and 10% of 2014 entrants had been influenced by the MOOC;
- In 2013, SSE received 5-year accreditation from the three relevant professional bodies;
- SSE has an excellent track record in raising the profile of STEM in its engagements with local schools and actively participates in two UTCs (University Technology Colleges);
- SSE has good relationships with industry through its Industrial Advisory Board (IAB).

13. Nevertheless, the Review Group considered that insufficient progress had been made in a number of respects, and these have been itemised below.
14. In terms of research, these areas of concern include:

- A disappointing research performance in REF 2014, which triggered the Review. In terms of quality, SSE gained a GPA of 2.76; on this indicator, SSE ranks 28th out of 36 HEIs that submitted to the UOA Electrical and Electronic Engineering, Metallurgy and Materials, at the top of the fourth quartile. In terms of intensity, SSE submitted 18 staff (17.2 FTE) or 55% of its eligible staff; for comparison, the University’s average intensity figure was 85%. The QR settlement 2015-16 for SSE quantifies the relative decline against the sector since the RAE 2008 in terms of research power: a reduction of £412K/annum, or 50% of QR;
- The written panel feedback from the REF 2014 states that the ‘Systems Neuroscience research group (a spin-off of the longstanding Cybernetics activity) has the highest proportion of outputs judged to be of world-leading quality’, implying that the long-standing expertise in Computer Science and Engineering produced few world-class outputs for the REF 2014. Furthermore, it appears that Computer Science lacked critical mass to be submitted to the UOA Computer Science and Informatics, so there was no submission from the University to this UOA;
- The feedback from the REF 2014 judges that SSE’s research environment is conducive to producing international excellent (3*) and international recognised (2*) quality; implying that world-class (4*) research will not be routinely produced in the existing research environment;
- Whilst SSE currently contributes over £2.5M/year to the University’s research grant income, the Review Group has concerns about future growth of research grants and, indeed, whether current levels of grant winning can be maintained; whilst the number of grant earners has been growing over the period since the 2009-10 review, the viability of the Intelligent Systems Research (ISR) centre, which has contributed very significantly (c. 25% of School research income in 2014/15) to the total grant income generated by SSE, is questioned in the light of a substantive fall in the number and volume of research grants won in recent years;
- The Infrared Multilayer Laboratory (IML) within SSE provides specialised equipment for the space industry and universities’ astronomy departments; whilst it breaks even or produces a small surplus on a cash basis, it does not generate sufficient funds to account for its full economic cost;
- In short, it is the view of the Review Group that since the 2009-10 review SSE has improved the quality of its research in terms of outputs and grant income when measured against its own performance in the past, and there is a continuing upward trend in terms of outputs. Nevertheless, when measured against the sector and the progress that comparator institutions have made, SSE has not been improving quickly enough to improve its position; furthermore, the Review Group has not been reassured that a sufficiently robust plan exists that ensures that the REF 2020 will see the required step-change in the quality and intensity of research when measured against the sector.
15. In terms of **teaching**, these areas of concern include:

- The number of undergraduate students on SSE programmes appears insufficient to support six programmes (with variants), despite a considerable sharing of modules across the various programmes. Recent student recruitment targets have been met, but in terms of viability only the BSc in Computer Science and the BSc Computer Science with Industrial Year programmes enrol substantial number of students. Prior to the start of the Review, and as part of its strategic refocusing of its undergraduate programmes, SSE had prepared the paperwork for the withdrawal of the BSc IT programmes; these had relatively low student numbers and required specialist modules not suitable for the School’s other programmes. (This proposal was put on hold by the Review Group.) During the Review the School developed proposals to withdraw the BSc Cybernetics and BSc Artificial Intelligence programmes;

- The A-level tariffs for SSE’s undergraduate programmes are below UoR’s median; in the sector, Electronic Engineering ranks 26th (out of 66 HEIs) with 358 points, and Computer Science ranks 44th (out of 101 HEIs) with 349 points;

- SSE has low numbers of international students, despite a large number of international students in the UK studying Computer Science (2013-14 entrants: 2815 for undergraduate and 870 for postgraduate programmes) and Electronic Engineering (2013-14 entrants: 2850 for undergraduate and 790 for postgraduate programmes);

- SSE’s levels of attrition/non-continuation of students across the undergraduate programmes are amongst the highest when compared to the UoR and the sector; in the new Planning System, this attrition will be included at School level and replace the flat 5% attrition rate currently applied across the University, with an adverse impact on SSE’s finances. A plan to reduce attrition rates was developed by the School during the first half of the Review period;

- SSE has low numbers of students on its master programmes, with the possible exception of the MSc in Advanced Computer Science, which has made a promising start;

- SSE received variable results in the NSS in 2014, with the programmes with small numbers of students performing generally well, but those with large student numbers (Computer Science) showing the poorest response, especially in the area of ‘Feedback and Assessment’;

- In short, it is the view of the Review Group that the rationalisation of the undergraduate offering since the 2009-10 review has been a positive development. Nevertheless, with the exception of the BSc Computer Science (and variants), the number of students enrolling on SSE programmes is generally too low to run as viable programmes. Furthermore, the Review Group notes, as a structural problem, the imbalance between Computer Science and Engineering, with a large number of students in Computer Science but relatively few high-quality research-active staff versus low numbers of students in Engineering and relatively many high-quality research active staff.
16. In terms of finances and management:

- SSE has recurrent financial deficits (see point 18). In 2013-14, the most recent years for which the financial outturn has been established, this amounted to minus £1.94 million, representing 26.4% of total income.
- For comparison, in 2013-14, the other Schools in the Faculty returned smaller deficits (SCME: £0.04M or 0.7% of total income; SMPS: £0.44M or 1.73%; SAGES £1.7M or 18.66%). Two Schools elsewhere in the University returned similar or greater ‘cash’ deficits, but at a significantly lower percentage of income (SCFP: £2.2M or 10.88% of total income; SAPD: £1.9M or 15.1%);
- The inclusion of the School-specific costs of student attrition under the new resource allocation model from 2016-17 will have a significant adverse impact on SSE’s finances.
- A high-level analysis of the I:E Accounts for 2013-14 shows that the Electronic Engineering part of SSE accounts for c. 75% of the deficit, and Computer Science for the remaining 25%;
- SSE has actively worked on the inclusion of BSc Electronic Engineering in the NUIST initiative, now as a Phase 2 development; there may be an opportunity for the BSc Computer Science to be included in a later phase; this would help to generate significant income in future years;
- SSE suffers from an ongoing lack of academic leadership that represents effectively both the Computer Science and Engineering parts of the School, and also within Computer Science more specifically; this issue has been raised on many occasions during the Review especially, but certainly not exclusively, in relation to the submission to the REF 2014; it is evident that SSE would need to undergo a significant culture change to embed effective leadership throughout its operation;
- The distribution of the teaching and administrative workload, ensuring that T-Intensive staff enable T&R staff to undertake research and aim for submission to the REF, has not been effectively implemented;
- The School’s current name is not meaningful to prospective (home, EU or International) students, as recently recognised by the School;
- In short, it is the view of the Review Group that some progress in the financial management has been made since the 2009-10 review, and it is conceivable that with the NUIST development (and the further rationalisations proposed by the School), SSE would find itself in a better financial position in the medium term. Embedding effective leadership requires a significant culture change, and the Review Group has found little evidence for a shared understanding of this need amongst SSE staff.

17. In shaping various scenarios for the School’s future, and in reaching its final recommendation, the Review Group was also mindful of financial, legal and estate considerations, as outlined below.
Financial considerations

18. Over a number of years, the University has used the I:E Ratios to determine the financial performance of Schools. Whilst this measure has served the University well in its planning processes, it does not elucidate the actual surpluses and deficits generated by Schools. Therefore, the University’s I:E Accounts have been used to assess the financial sustainability of SSE and the range of options presented below. Whilst the I:E Accounts include accurate allocations of direct and indirect costs for the academic years 2013-14 (based on actuals), 2014-15 (based on the outturn at the end of Q2), and 2015-16 (budgeted), using this measure for the period 2016-17 onwards has to come with some provisos in the light of the planned changes to the resource allocation model and the Efficiency and Effectiveness review of the University. Therefore, the five-year forecasts based on the I:E Accounts should be used to indicate future trends rather than actual forecast surpluses and deficits generated under the four scenarios.

Legal considerations

19. The Review Group has received legal advice on the formal implications of the scenarios it has developed. This stage of the formal Review has focused on structures and elements of SSE’s activity, rather than individuals. Any implementation phase of the formal Review is advised to take full account of the legal advice.

Estate considerations

20. Towards the end of Review Process, the University’s Space Manager was invited to comment on the impact of the four scenarios on the Estate Strategy and the estate components of the Research Strategy. The implications of the scenarios have been included here to ensure that UEB, Senate and Council can take the broadest possible view on what is proposed.

Vision for the future of the School / the School’s activities

21. The high-level aspirations for the University of Reading were set out in Vision, Ambition, Strategy 2026, the positioning document for the University Strategy. This document provides the framework for determining the vision for the future of all our Schools and refers specifically to world-class research that is impactful and education that is relevant and attractive. The Strategy includes indicators of ‘unambiguous measures of success’, notably embedding the University in the top 25 of UK Universities; remaining in the top 1% of institutions worldwide; and growing our income by 25%.

22. The vision for SSE / SSE’s activities is that it delivers high-quality research in a financially sustainable context. This means that SSE / SSE’s activities:

- Produces research that is situated within the top quartile in the UK sector, as measured by formally recognised exercises such as the Research Excellence Framework (REF);
• Attains financial sustainability, which requires that income generated from teaching and learning, research and other sources equates at least to the full economic cost of delivering these activities. In turn, this means that the portfolio of taught programmes is relevant, attractive and of a high quality to be viable in the long term, as this underpins the financial sustainability of all academic operations.

23. The University Strategy has a target date of 2026, and the University does not expect SSE / SSE’s activities to deliver the high-quality research in a financially sustainable context instantly. Nevertheless, the outcome of the REF 2014 provides an externally validated assessment of the quality of the overall research undertaken in SSE which falls well short of what could be expected at this point in time. The feedback from the REF 2014 did include acknowledgement of world-class research, and mentioned Systems Neuroscience as the area where most world-class outputs had been produced. Because the disappointing REF 2014 results triggered the Review of SSE, much of the attention of the Review Group has inevitably been focused on research activities. However, the Review Group fully understands that the financially sustainable context requires a portfolio of taught programmes that is relevant, attractive and of high quality to be viable in the long term, and the four scenarios that have been developed encompass research, teaching and learning, and the financial sustainability of SSE / SSE’s activities.

Options for the future of the School

24. The Review Group considered a number of options for the future of the School. The Review has sought to protect and develop the best aspects of SSE’s existing activity for the benefit of the University as a whole, but SSE is a complex organisation with the individual research and teaching elements that comprise the School performing at different levels, with diverse degrees of financial sustainability, and with no unequivocal way of achieving or contributing to the ‘unambiguous measures of success’ defined in the University’s Strategy. Employing the different scenarios has enabled the Review Group to refine its rationale in the process of determining its final recommendation.

25. The submission to the Review from the Acting Head of SSE, who sought input from a large number of colleagues, outlined a number of possible future scenarios for SSE / SSE’s activities, and the first three of the four scenarios presented below are to a greater or lesser extent based on this submission. The four scenarios were presented to staff in SSE on 29 April 2015, and feedback was invited. In the few responses received, the majority of SSE staff expressed a preference for scenario 1, but support was expressed by individuals for scenarios 2 and 3; no support was expressed for scenario 4.
26. Under this scenario, SSE would become the School of Computer Science and Electronic Engineering (SCSEE), continuing the breadth of its current research but with a reduced teaching portfolio.

27. The new School would be a single research division (Engineering Science) with the expectation that it would return to a single UOA at the REF 2020 (General Engineering). During the Review, it has been argued that the submission to the UOA Electronic Engineering, Metallurgy and Materials had been a misjudgement and that submission to the UOA General Engineering would have resulted in a much better ranking (at the top of the third quartile) with the same GPA. During the Review, SSE has presented a new proposed research division (Engineering Science) with the following subtopics: Systems Neuroscience; Healthcare Engineering; Control, Energy and Robotics; Terahertz and Infrared Technology; Wireless Communications and Embedded Systems (these five subtopics make up Engineering); Data Science/Big Data; Computing and Software; Computational Intelligence; Computational Vision (these four subtopics make up Computer Science).

28. The new School would further rationalise its teaching portfolio, withdrawing from all 4-year MEng programmes alongside the BSc IT, BSc Artificial Intelligence and BSc Cybernetics (and variants) programmes. Thus, the new School would focus on the delivery of three undergraduate programmes: BSc Computer Science, BSc Robotics and BSc Electronic Engineering (all with the Industrial Year option). The BSc Electronic Engineering would be delivered as part of the NUIST initiative (phase 2), and BSc Computer Science could be included in a later phase. Furthermore, variants in teaching delivery could include a BSc Computer Science (Enterprise) to replace the BSc IT; a BSc Computer Science with Robotics and a BSc Computer Science and Electronics, which would lead to further streamlining the undergraduate portfolio with associated savings. Further variants could include introducing an MSc in Systems Neuroscience and Neuroengineering, and considering the development of an MSc conversion in Computer Science.

29. In terms of financial sustainability, the withdrawal from the various programmes equates to a teaching load of 463 contact hours (lectures, practical classes, tutorials and seminars), equating to an estimated 8 to 10 FTE T+R or T-i staff. This reduced staffing requirement, combined with income generated from the NUIST development and ongoing success in research grant generation, is expected to return the School to a (modest) surplus in the medium term.

30. In terms of the Estate Strategy and the estates element of the Research Strategy, there is likely to be some opportunity to restack the school if certain activities are wound down. Any space released would likely be of tactical rather than strategic value. It could be possible to re-integrate ISR staff, releasing space in J J Thomson Building (JJT).
31. Considering this scenario, the Review Group recognises the following advantages and disadvantages.

**Advantages**
- Submission to the General Engineering UOA for the REF 2020 is likely to provide a better fit for a number of specialisms represented in the new School, including medical engineering, bioengineering, biomechanics, environmental engineering, sustainability engineering, renewable energy and control systems engineering;
- The research income generation and KTP capacity of SSE would be retained for the University in the new School;
- Existing research synergies and collaborations within and beyond the new School would be retained;
- Disruption for existing PhD students would be minimised;
- Disruption to the delivery of teaching would be minimised, whilst the new School would have the capacity to teach out the MEng programmes, and the BSc IT, BSc Artificial Intelligence and BSc Cybernetics programmes (with variants);
- The ability to deliver the BSc Electronic Engineering in the NUIST model would be retained within the University;
- The University would retain the existing MOOC and pedagogical innovation capacity in SSE;
- This scenario would pose only limited risk to UoR’s good reputation.

**Disadvantages**
- The UOA General Engineering for the REF 2020 is not a good fit for Computer Science activity;
- There is no doubting that SSE continues to improve its research activity compared to its past performance, but it is not clear that this scenario would result in improvements relative to the sector;
- Continuing to offer two undergraduate programmes (BSc Robotics and BSc Electronic Engineering) with low student numbers;
- The academic leadership issue remains unresolved; this is of particular concern in view of the unit’s research development and plans for the REF 2020, noting the many issues that have been raised about the REF 2014 submission;
- Investment in leadership capacity in Computer Science remains a requirement;
- Continuing imbalance of the SSRs in Computer Science and Engineering parts of SSE.

**Scenario 2: Create a Department of Computer Science and Engineering within the School of Mathematical and Physical Sciences**

32. Under this scenario, SSE as a stand-alone School would cease to exist and a new Department of Computer Science and Engineering would be created within SMPS. The integrity and synergies that exist within SSE would be maintained, but the existing leadership and management structures of one of our most successful Schools would be utilised to ensure the future success of the research and teaching activities. This scenario envisages a rationalisation of the research and teaching portfolios.
33. The rationalisation of research would involve retaining those activities that contribute closely to the five University research themes, notably Health, Food, Environment, Prosperity and Resilience and Heritage, Creativity & Values. Under this scenario, submission of current SSE staff to the General Engineering UOA for the REF 2020 would need to be reassessed and submission of staff to other UOAs would be considered under the new structures to be established through the University’s Research Strategy 2020.

34. The new Department would be expected to rationalise its teaching portfolio along similar lines as under scenario 1, withdrawing from all 4-year MEng programmes alongside the BSc IT, BSc Artificial Intelligence and BSc Cybernetics (and variants) undergraduate programmes. Thus, the new Department would focus on the delivery of three undergraduate programmes: BSc Computer Science, BSc Robotics and BSc Electronic Engineering (all with the Industrial Year option). The BSc Electronic Engineering would be delivered as part of the NUIST initiative (phase 2), and BSc Computer Science could be included in a later phase. Furthermore, variants in teaching delivery could include a BSc Computer Science (Enterprise) to replace the BSc IT; a BSc Computer Science with Robotics and a BSc Computer Science and Electronics, which would lead to further streamlining the undergraduate portfolio with associated savings. Further variants could include introducing an MSc in Systems Neuroscience and Neuroengineering, and considering the development of an MSc conversion in Computer Science.

35. In terms of financial sustainability, the closure of SSE and the creation of a Department of Computer Science and Engineering within SMPS, including the rationalization of the research and teaching portfolio but including the delivery of the NUIST programmes, is expected to return the Department to a (modest) surplus in the medium and long term.

36. In terms of the Estate Strategy and the estates element of the Research Strategy, this scenario has an impact similar to scenario 1 although more space would be released in the Systems Engineering Building; it might be possible to restack the School and consider the use of some of the space in the interim as decant capacity.

37. Considering this scenario, the Review Group recognises the following advantages and disadvantages.

**Advantages**
- The research income generation and KTP capacity of SSE would be retained for the University in the new Department and this change could lead to optimising research grant application successes by joining a School with a track record in grant winning;
- Existing research synergies and collaborations within and beyond the new Department would be retained and new synergies and collaborations could develop with Mathematics and Meteorology;
- The creation of a new Department would cause only limited disruption for existing PhD students;
Disruption to the delivery of teaching would be minimised, whilst the new Department would have the capacity to teach out the MEng programmes, and the BSc IT, BSc Artificial Intelligence and BSc Cybernetics programmes (with variants);

The ability to deliver the BSc Electronic Engineering in the NUIST model would be retained within the University;

The University would retain the existing MOOC and pedagogical innovation capacity in the new Department;

SMPS provides overarching academic leadership and structures that have a proven track record of excellence;

Limited risk to UoR’s good reputation.

Disadvantages

- Staff with research in their contract might have to re-focus their expertise on delivering outputs that can be submitted to UOAs other than Electronic Engineering, Metallurgy and Materials or General Engineering;
- Continuing to offer two undergraduate programmes (BSc Robotics and BSc Electronic Engineering) with low student numbers;
- This proposal could pose a significant threat to the reputation of SMPS, and would potentially divert management time that is urgently required elsewhere; this scenario is not supported by SMPS;
- Investment in leadership capacity in Computer Science remains a requirement;
- Continuing imbalance of the SSRs in Computer Science and Electronic Engineering.

Scenario 3: Reduce and distribute SSE activity

38. Under this scenario, SSE as a stand-alone School would cease to exist, the University would disinvest in systems engineering, but retain individual and clusters of high-quality research staff who have a strategic research fit elsewhere in the UoR, teaching-intensive staff who can contribute to the co-delivery of the retained teaching portfolio, and relevant support staff. This teaching portfolio would include the BSc Computer Science (with variants) and possibly related programmes, but the suite of existing engineering programmes currently taught in SSE (MEng programmes and the BSc Electronic Engineering; BSc Robotics; BSc Cybernetics; BSc Artificial Intelligence – plus variants) would be closed for new entrants in 2016. Potential new programmes that could be developed include a BSc Neuroscience and MSc Systems Neuroscience, and a BSc in Bio-engineering.

39. Retaining individuals and clusters of high-quality research and teaching intensive staff who have a strategic research fit elsewhere in the UoR would include:

- A group from Computer Science to transfer to SMPS to form a new Department of Computer Science. In terms of research, a REF 2020 submission to UOA Computer Science is not considered a likely option, and submission into a UOA that fits with the Research Strategy 2020 and the research focus of SMPS (e.g. Big Data Analytics and Data Science fit well with Mathematics and Environmental
Science UOAs) is likely to be more appropriate. This Department would continue to deliver the BSc Computer Science and MSc Advanced Computer Science (with HBS) and could consider the variant of a BSc Computer Science (Enterprise) to replace the BSc IT. The MOOC and pedagogical innovation capacity would be included in this Department.

- A selected group from Neuroscience centred around the Brain Embodiment Laboratory could move to SPCLS where it would form the core of a new Department or cluster of Neuroscience. This group would aim for inclusion in the UOA Psychology, Psychiatry and Neuroscience in the REF 2020. This group could develop and deliver a new BSc Neuroscience and MSc Systems Neuroscience to extend the current provision in SPCLS. Such a move would be welcomed by the Head of School (HoS) of SPCLS;

- Selected SSE staff from Control, Energy and Robotics whose work is focused on energy could transfer to SCME where energy is an area of prioritised growth, and aim for inclusion in the REF 2020 for the Built Environment. Such a move would be welcomed by the HoS of SCME;

- Selected staff from Computer Science and with specialisms in Data Science/Big Data Analytics could transfer to BISA (Business Informatics, Systems and Accounting) in HBS, from where the new BSc Computer Science (Enterprise) and MSc in Advanced Computer Science could be delivered and expanded in collaboration with the new Department in SMPS. This transfer would be welcomed by the HoS of BISA and the Dean of HBS;

- Furthermore, the Review Group recommends under this scenario the creation of a Centre for Bio-Engineering, which would retain the high-quality research and teaching staff specialised in Healthcare Engineering, Cybernetics, Robotics, and other relevant aspects in Engineering. Bio-Engineering is recognised as one of the areas of UOA General Engineering and a focused submission to this area might be appropriate; alternatively, some of the research could potentially strengthen the submission to the UOA Allied Health Professions. The Centre for Bio-Engineering would develop its research in line with the University’s Health Strategy and focus on EPSRC funding. Furthermore, this Centre would take ownership of the teaching out of MEng programmes and the BSc Electronic Engineering, BSc Robotics, BSc Cybernetics and BSc Artificial Intelligence (with variants). It is proposed that, for an initial period of no more than five years, the Centre would be a stand-alone academic unit with its own budget. This proposal has the support of the incoming Research Dean for Health, who is willing and able to provide oversight of the research direction of the new Centre.

40. The financial sustainability of each part of this scenario depends on the degree of success in integrating staff into existing structures, grant applications and student recruitment, and detailed forecasts are not available. Nevertheless, the overall trend shows a (modest) surplus in the medium term of the elements of this scenario and a rapid move towards surplus generation for the Department of Computer Science in SMPS.
41. In terms of the Estate Strategy and the estates element of the Research Strategy, this scenario could offer opportunities for re-zoning health and food activity around the University’s Pepper Lane entrance with the move of SPCLS to the Systems Engineering Building and Lyle; and re-zoning Environmental Science around the Earley Gate area with Computer Science, Meteorology and Institute for Environmental Analytics (IEA), and possibly Mathematics and Statistics, moving into Harry Pitt Building. Space released at Earley Gate could then accommodate anticipated growth in SMPS.

42. Considering this scenario, the Review Group recognises the following advantages and disadvantages.

**Advantages**
- A significant share of the existing research income generation and KTP capacity of SSE would be retained for the University in SMPS, SPCLS, SCME, HBS and the new Centre for Bio-Engineering, and the University would retain its EPSRC-facing activity;
- Research income generation could be improved in new Schools with clear management structures and high success rates in grant applications;
- The majority of existing research synergies and collaborations would be retained and new synergies and collaborations could develop in SMPS, SPCLS, SCME and HBS;
- Retain a viable BSc Computer Science, and offer continuity for c. 60% of all undergraduate students currently in SSE;
- SMPS, SPCLS, SCME and HBS provide overarching academic leadership and structures;
- The Centre for Bio-Engineering would strengthen the Health strategy, retain access to EPSRC funding, and provide a mechanism to teach out the MEng programmes, and the BSc Robotics, BSc Electronic Engineering, BSc Artificial Intelligence and BSc Cybernetics programmes;
- Financial stability, with a likelihood of a modest surplus of this scenario in the medium term and a rapid move towards surplus generation by a Department of Computer Science within SMPS.

**Disadvantages**
- Creation of a new department of Computer Science could be a distraction for SMPS, though SMPS foresees that the new Department could be made successful in teaching and in research, once the Departments’ research focus aligns with SMPS’;
- Some existing research synergies may be disrupted, endangering existing research activities;
- Disruption for existing PhD students;
- Risk to UoR’s good reputation.
Scenario 4: Disinvest in all SSE activities

43. Under this scenario, the University would disinvest in all SSE activities. Transfer of high-quality research and teaching staff, alongside relevant support staff, to other parts of the University would only be considered where this fulfils a clear strategic need (possible examples listed under scenario 3). The University would close enrolment on all taught programmes to new entrants from 2016, seek transfer of current students to other HEIs, and teach out remaining students. Significant financial savings are linked to this restructuring scenario; at steady state (when the last SSE students have left UoR), recurrent savings of c. £800k/annum are realistic. In terms of the Estate Strategy and the estates element of the Research Strategy, this option would allow for re-zoning health and food at Pepper Lane and environment at Earley Gate, as described under scenario 3.

44. Considering this scenario, the Review Group recognises the following advantages and disadvantages.

Advantages
- Significant financial savings in the long term.

Disadvantages
- Relinquish a significant share of the existing research income;
- Significant disruption of existing research synergies, endangering existing research activities; SPCLS and SPMS considers this the worst-case scenario;
- Significant challenges to teach out the MEng programmes and the BSc Computer Science, BSc IT, BSc Electronic Engineering, BSc Robotics, BSc Artificial Intelligence and BSc Cybernetics programmes (plus variants); this may be partly offset by arranging opportunities for existing students to transfer to similar programmes elsewhere, but the University is legally obliged to offer the programmes till the end of the academic year 2018-19 for students who do not wish to move;
- Loss of the MOOC and pedagogical innovation capacity currently in SSE;
- A very significant disruption for existing PhD students;
- A very high risk to UoR’s good reputation.

45. Two elements of SSE’s activities are currently more or less freestanding, and the observations below can be applied to all four scenarios presented above:

- The Intelligent Systems Research (ISR) Laboratory is recommended to be closed and its activities to be fully incorporated in the new School (scenario 1) or the Department of Computer Science and Electronic Engineering (scenario 2) or the Department of Computer Science (scenario 3);
- The Infrared Multilayer Laboratory (IML) to develop a viable business plan which includes the recovery of the full economic costing of its activity; if this is not possible, then the University should consider transferring IML to an entity outside the University or closing IML.
Conclusions

Having considered the four scenarios in depth, and taking full account of the information, data and feedback received throughout the Review period, the Review Group recommends that the University Executive Board, Senate and Council select scenario 3. It is the considered and unanimous view of the members of the Review Group that this scenario is the best option to maintain and enhance the University’s efficiency, effectiveness and financial viability and, in doing so, protects (as far as is possible) the current and future employment of all categories of University staff. Teaching and learning commitments to all existing students, plus those due to start in 2015, would be honoured so that all students would complete their programmes.

The reasons for recommending this scenario are that it provides a framework for:

- Retaining and strengthening the areas of world-class and impactful research currently in SSE that provide a close fit with the University’s Research Strategy 2020;
- Retaining and strengthening the areas of teaching currently in SSE that are most relevant and attractive to current and future students;
- Strengthening the leadership for these areas of research and teaching through the utilization of the effective leadership and efficient structures that are available in other Schools without significantly disrupting the management in any single School;
- Placing these areas of research and teaching onto pathways of financial sustainability.

As detailed in the considerations, advantages and disadvantages of each of the scenarios provided, the Review Group does not consider that any other of the proposed scenarios is able to deliver these four desired outcomes. The Review Group considers that the disadvantages of scenario 3 can be mitigated significantly, such that the cost-benefit balance is strongly weighted towards benefits:

- While the creation of a new department of Computer Science places an additional responsibility on SMPS in addition to the School’s existing priorities, it is a significantly smaller undertaking than creating a new department of Computer Science and Engineering as outlined in scenario 2, while bringing great potential benefits;
- While there is a risk that some research synergies may be disrupted, this scenario maximises opportunities to consolidate existing cross-University research synergies and initiate new ones;
- The transition for existing PhD students and the teaching out of discontinued Engineering programmes can be supported strongly to minimise the impact of existing students;
- The clear strategic role of a Centre for Bio-Engineering within the Research Strategy 2020 will help ensure the leadership and structures necessary to realise the desired research outcomes are in place;
- Any reputational risk to UoR will be mitigated by maximum transparency in the decision-making process and the implementation process.

49. In accordance with the University’s Review and Restructuring Policy (2010), the staffing implications arising from the recommendations are detailed here, however noting that the exact shape and size of the new Department of Computer Science within SMPS and the Centre for Bio-Engineering will be determined by the Restructuring Committee. The cessation of research in areas that are not world-class and impactful or do not provide a close fit with the University’s Research Strategy 2020, and of teaching in areas that are not relevant and attractive to current and future students, is estimated to result in a reduction of 10 to 15 FTE academic staff, and 20 or more FTE support staff.

Recommendations

50. UEB is asked to approve the following recommendations and undertake the next steps, which are:

1. To approve the recommendation of the Review Group of scenario 3;
2. To make this recommendation to the Strategy and Finance Committee on 15 June;
3. Subject to approval of the recommendations by the Strategy and Finance Committee, to debate the report and recommendation of the Review Group at Senate on 2 July;
4. Subject to approval of the recommendations by the Strategy and Finance Committee, to request that the Council consider and approve the report and recommendation of the Review Group on 13 July;
5. As the report’s recommendations point to a reduction in the number of academic staff (as defined by Statute XXXIII), it be recommended to the Council through the Strategy and Finance Committee that, in accordance with the University’s Review and Restructuring Policy, a Restructuring Committee be established with the following membership:
   - A Chair
   - One member of the Council not being a person employed by the University
   - One member of the academic staff nominated by the Senate
   - Either the Deputy Vice-Chancellor or a Pro-Vice-Chancellor (and nominate the PVC AP&R)
   - The relevant Dean (that is, the Dean of the Faculty of Science)
   - The relevant Head of School or equivalent office holder