ASTUTE 2020

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ASTUTE 2020

Advanced Sustainable Manufacturing Technologies

Business Plan for ERDF funding

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by

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Executive Summary

High Value Manufacturing is a key economic activity in Wales and there is recognised world-class manufacturing expertise in Welsh universities. This provides an excellent opportunity to address the need for Research, Development and Innovation (RD&I) in industry by facilitating collaboration between the high value manufacturing industry and academia in areas that can achieve high economic impact.

ASTUTE 2020 is a proposal for a five year, £14.7 million operation under the ERDF Priority 1, Specific Objective 1.2. The aim is to enable transformational and sustainable operation of and growth in the manufacturing industry of West Wales and the Valleys (WWV) by facilitating the adoption of advanced technologies, increasing competitiveness and future proofing. This will be achieved by means of demand-led collaborative RD&I, and knowledge exchange with industry through an *Adaptive Smart Specialisation* approach, whereby a partnership of Welsh Universities will harness the world-leading and internationally excellent manufacturing expertise within them to improve the economic prosperity of the Region.

The proposed operation will directly address the *Advanced Manufacturing* thematic economic opportunity of the Economic Prioritisation Framework and will target the "Grand Challenge" of *Advanced Engineering and Materials*, with additional expected further benefits for all the other Grand Challenge areas.

Swansea University will be the Lead Beneficiary of the operation, which will build on the original ASTUTE (Advanced Sustainable Manufacturing Technologies) project that successfully ran from 2010-2015 with a total budget of around £27 million. Close to 300 companies in WWV benefitted from interactions with ASTUTE and all the result indicators exceeded the original targets. A significant economic impact of over £200m has been achieved through collaboration with companies, who provided very positive feedback. Furthermore, the independent Final Evaluation of ASTUTE described it as an "exemplar of successful industry/academia collaboration".

The two core partners of the proposed ASTUTE 2020 operation will be Swansea University and Cardiff University. Both these institutions are in the top 10 UK Institutions for Engineering Research (by GPA) in the 2014 Research Excellence Framework. Contributions from two other Welsh HEIs, Aberystwyth University and University of Wales Trinity Saint David (UWTSD), in niche specialist areas of expertise will provide additional benefits. The operation will focus on the most successful operational parts and areas of high impact of ASTUTE while also incorporating significant changes from extensive discussions with industry, stakeholders and from a forward looking exercise. Specifically, we will concentrate on the following three *Adaptive Smart Specialisations* which address industrial RD&I needs of manufacturing companies in WWV:

- **Computational Engineering Modelling**, addressing the need to reduce costly "trial and error" approaches in understanding and improving complex manufacturing processes and manufactured products.
- **Advanced Materials Technology**, addressing the need to fully understand existing materials, to introduce new materials into products and to adopt more innovative techniques for processing other advanced materials.

- **Manufacturing Systems Engineering**, addressing the need to improve the use of resources in the manufacturing process, to manage more effectively the supply chain of products and services entering the company, and to exploit digital processes and connectivity.

Focussing our resources in this way will enable the proposed ERDF investment to be targeted at areas that offer the best economic opportunities for manufacturing within *WWV*. These *Adaptive Smart Specialisations* underpin and enable multi-disciplinary support for complex processes, products and systems. The operation relies on applying the existing HEI expertise "pointwise" in collaborations to support achievement of larger ambitions by companies. For instance, smart Manufacturing covers a wide range of issues such as data management, internet of things, communication, sensor technology, etc. ASTUTE 2020 could support smart Manufacturing developments in companies, but only specific aspects of it rather than a complete installation.

The delivery of the proposed operation will be principally by industry-demand led *Collaborative Research* between Companies and the Universities that make up the partnership, with the ERDF funds being used to fund highly qualified Project Officers to work alongside academics within the *Adaptive Smart Specialisation* areas. This mechanism of collaborative RD&I has been used extensively and successfully during ASTUTE and we are fully aware of the requirement for diligent administration to ensure full compliance with the funding framework, including issues associated with State Aid. An experienced administrative team will thus be included in the budget.

The outcome of these collaborative research projects will be economic impact achieved via RD&I that leads to the launch of new and improved products and processes. This will generate increased turnover and employment in the participating companies, and hence increased growth and prosperity in WWV.

Significant match funding of approximately £4.7 million for the operation will be provided through the time of academics employed at the Universities and the University overheads (using a 25% simplified cost model). For a total operation budget of £14.7 million this leaves a funding gap of £10 million, for which we would like to request an ERDF grant at an intervention rate of 68%.

1 Strategic Fit

ASTUTE 2020 is a proposal for an operation under the ERDF Priority 1, Specific Objective 1.2 of the ERDF Operational Programmes for WWV. It directly addresses the *Advanced Manufacturing* thematic economic opportunity of the Economic Prioritisation Framework and is fully aligned with the Smart Specialisation Strategy for Wales (as set out in *Science for Wales* and *Innovation Wales*), targeting areas with the best economic opportunities in the Grand Challenge area of *Advanced Engineering and Materials*. ASTUTE 2020 has been received favourably Industry Wales and by the North Wales Economic Ambition Board, Cardiff Capital Region Board and the Swansea Bay City Region Board. This proposed new operation will build on the successful ASTUTE project that has been running from 2010 to 2015.

Over the last five years during successful project delivery the ASTUTE team has gained detailed knowledge of industrial RD&I needs of Welsh manufacturing companies. Furthermore, we have also obtained an appreciation of the World Leading and Internationally Excellent manufacturing related expertise from within Welsh Universities. Mapping the industrial needs onto the academic world-class expertise while ensuring full alignment with the Wales Smart Specialisation Strategy has led to the identification of three *Adaptive Smart Specialisations* for ASTUTE 2020:

- Computational Engineering Modelling,
- Advanced Materials Technology, and
- Manufacturing Systems Engineering.

These ASTUTE 2020 *Adaptive Smart Specialisations* are underpinning areas of recognised expertise very relevant to high value manufacturing. They therefore support a diverse range of companies – from automotive and aerospace to medical engineering and potentially food industries – and also a wide range of areas such as additive manufacturing or smart manufacturing.

For example in the field of Computational Engineering Modelling, from experience we know that many manufacturing processes will need advanced computational simulation of heat transfer, fluid flow, particle flow, machining, structural performance, fluid-structure interaction etc. to be able to fully understand the complex physics present in virtually all manufacturing operations. By understanding these phenomena, the manufacturing process can then be improved for better yields or lower energy consumption. A recognised and proven expertise base is essential here to be able to deliver a focused support for the many manufacturing processes and manufactured products ASTUTE 2020 is likely to encounter. The same is true for the other underpinning ASTUTE 2020 *Adaptive Smart Specialisations*.

Focussing our resources in this way will enable the ERDF investment to be targeted at areas that offer the best economic opportunities for manufacturing within WWV.

1.1 Background to the first ASTUTE Project, 2010 - 2015

Started in May 2010, Advanced Sustainable Manufacturing Technologies (ASTUTE) was a £27m project part-funded by a grant of £14m from the ERDF. ASTUTE has enabled a partnership of all

eight Welsh Universities to focus on technologies related to manufacturing. Leading academic experts from these institutions have been working together effectively for the past five years in conjunction with a team of highly qualified project officers to deliver significant economic benefits in WWV through working collaboratively with companies.

As shown in Table 1.1, 300 companies have benefited from ASTUTE assistance and all the other targets set for the project in May 2010 have been achieved or exceeded, despite the long periods of multiple recessions in the UK during this time frame.

Table 1.1 ASTUTE Outputs and Results indicators

Indicator	Original Target	Achieved by 26 Feb 2016
Enterprises assisted	**350** [1]	**300**
Collaborative R&D	**40**	**152**
Innovation centres and R&D facilities developed	**200 m^2**	**483 m^2**
Gross Jobs created	**130**	**174**
Enterprises Created	**5**	**10**
Investment Induced	**£4M**	**£9.3M**
Enterprises adopting or improving Equality Strategies and Monitoring Systems	**20**	**30**
Enterprises adopting or improving Environmental Management Systems	**16**	**36**
Products, processes or services registered	**40**	**42**
New or improved products, processes or services launched	**120**	**383**

ASTUTE's model is focused on technical delivery underpinned by a robust and strong selection process. Since the selection and the delivery, which means collaboratively working with companies solving complex problems for the latter, are done in-house, the ASTUTE model is typically quicker and more efficient than some other programmes, which decouple both processes by outsourcing delivery after an in-house selection process.

ASTUTE's model of providing responsive, demand-led, easy-to-use, collaborative support for

[1] This target was later reduced to 277.

manufacturing companies has received very positive feedback from industry, policy makers, independent experts and academia alike during these economically difficult times for business. The Institute of Welsh Affairs report[2] on an economic strategy for Wales recognises ASTUTE as one of the important government measures to increase RD&I in Wales by increasing enterprise awareness of RD&I importance and universities' commercial focus. ASTUTE's success was confirmed in the very positive results of the independent Final Evaluation[3] where the companies collaboratively working with ASTUTE have given encouraging and highly supportive feedback on the work done.

As a consequence of the extensive collaborations ASTUTE has entered into with local enterprises, the project team has gained invaluable knowledge and practical experience which includes:

- Intimate understanding of the challenges and barriers faced by SMEs and other manufacturing companies in conducting RD&I in order to overcome manufacturing problems and to take new products to the market.
- Intimate understanding of which areas of academic expertise are required by the WWV manufacturing industry and which ones of those can be provided by the world-class expertise within Welsh HEIs, e.g. Computational Engineering Modelling, Advanced Materials Technology and Manufacturing Systems Engineering.
- Appreciation of the global trends in manufacturing, the impact they have on companies in WWV, and the technology areas that can provide solutions and allow companies to exploit new opportunities.
- Understanding of the development and delivery of a demand-led, highly efficient, responsive, easy-to-access, collaborative applied research model enabling truly productive academia-industry knowledge-driven interaction.
- Expertise to effectively and collaboratively work with a large number of SMEs and also multinational enterprises (MNEs) with operations in WWV.
- Some understanding of the assistance required by business to re-patriate the manufacturing supply chain back to WWV from overseas.
- Understanding of the administrative requirements and practices in terms of project governance.

1.2 Vision for ASTUTE 2020

Given the strong continuous demand for ASTUTE expertise by companies, and the extremely

[2] An economic strategy for Wales?, Institute of Welsh Affairs, March 2015 http://www.iwa.org.uk/en/publications/view/240

[3] Report on the Final Evaluation of ASTUTE, "Final Evaluation Report for the ASTUTE (Advanced Sustainable Manufacturing Technologies) Project" carried out by Ciotek, June 2015 http://gov.wales/funding/eu-funds/previous/impact/project-evaluation/astute/?lang=en.

positive feedback the ASTUTE team has received from collaborating companies, independent experts and policy makers, ASTUTE HE partners from across Wales, led by Swansea University, are now proposing a newly configured, focussed operation entitled "ASTUTE 2020". This will cover the next five years, with the aim of moving ASTUTE's impact on the Welsh economy from 'incremental' to 'transformational'. ASTUTE 2020 will build on the most successful aspects of the current ASTUTE project but taking a more focussed and concentrated approach. The World Class Engineering and Science capabilities in Welsh Universities (evidenced by the findings of very recent Research Excellence Framework 2014) will be used to further develop and embed Advanced and Sustainable Technologies into High Value Manufacturing across WWV by collaboratively working with Welsh businesses. The operation will be a major contributor for a Welsh Innovation Ecosystem in the Welsh Government Grand Challenge of Advanced Engineering and Materials utilising Adaptive Smart Specialisation.

The ASTUTE 2020 team consisting of world-class academics and highly qualified project officers will be located in participating Welsh HEIs and will be working with manufacturing companies and company operational bases in WWV. Through the networks established in the Universities, many links exist with overseas institutions and these will be maximised to enable participation of Welsh SMEs and the MNEs with a presence in WWV in collaborative projects including Horizon 2020 further enhancing economic impact in WWV. We will also use our existing, extensive networks of national and international links to identify 'outside experts' who will contribute to horizon scanning and future proofing exercises for the benefit of Welsh industry.

1.3 The Aim for ASTUTE 2020

The aim for ASTUTE 2020 will be as follows:

> **To enable transformational and sustainable growth in the manufacturing industry of WWV by facilitating the adoption of advanced technologies, increasing competitiveness and future proofing. This will be achieved via an Adaptive Smart Specialisation approach, whereby a partnership of Welsh Universities will harness the world-leading and internationally excellent manufacturing expertise within them to improve the economic prosperity of the Region by means of demand-led collaborative research, development and innovation, and knowledge exchange with industry.**

1.4 Need and Demand for RD&I from the Manufacturing Industry of WWV

Since ASTUTE 2020 will be a demand-led operation, it is appropriate at this stage to highlight the RD&I needs of the manufacturing industry in WWV. We have experience of these requirements through our extensive collaborations and in-depth discussions with a range of Welsh manufacturing companies and Industry Wales over the last five years. We have also taken external advice from

GWOS Consulting Ltd.[4] with regards to Global Megatrends in manufacturing, their relevance to the Welsh manufacturing industry and how to support the local manufacturing industry to meet and to exploit these. This analysis is described in more depth in the section on "*Suitability of Investment*".

Broadly speaking, in order to achieve high impact and sustainable growth through innovation, we have observed the following RD&I needs from Industry in WWV:

a) The need to reduce costly "trial and error" approaches in improving manufacturing processes and manufactured products and to increase understanding of complex processes and products.
b) The need to introduce new materials into products, to adopt more innovative techniques for processing other advanced materials and to better understand materials and their behaviour.
c) The need to improve the utilisation of all resources in the manufacturing process and supply chain of products and services upstream and downstream of the company and to exploit digital processes and connectivity in the manufacturing process.

We would like to emphasise that these are broad needs that are present across WWV, but they are also relevant for East Wales as our discussions showed and as underpinned by strong interest from East Wales companies. In addition to support from Industry Wales, we have also had useful discussions with the North Wales Economic Ambition Board, and Cardiff Capital Region Board. However, we have not established any particular geographical trends between the separate regions of WWV in terms of industrial RD&I needs of manufacturing companies.

Many of these needs and the matching university expertise are applicable to manufacturing companies across a variety of sectors. These can include aerospace, automotive, energy generation, oil and gas, medical devices, white goods, electronics, foods, etc. For instance, all of these industries make more and more use of sometimes complex computer models and systems modelling to better understand and therefore to be able to improve their manufacturing processes, manufactured products and supply chain.

1.5 Adaptive Smart Specialisations

The previous ASTUTE project has seen an increasing stream of collaboration requests from companies in a range of different technology areas relating to manufacturing processes and manufactured products. In accordance with a Smart Specialisation approach, however, we have identified the key target areas for high economic impact and ASTUTE 2020 will focus only on those areas of demand where we can specifically bring to bear the established world-leading and internationally excellent expertise found across the Welsh HEI partnership to address the industrial RD&I needs outlined above.

[4] ASTUTE Welsh Manufacturing Futures to 2050 - A Strategic Analysis. Report of work undertaken 2014, GWOS Consulting Ltd.

1.5.1 Criteria for Selection of Specialisations

The criteria we have used for selecting the Smart Specialisations are as follows:

1) Each specialisation must address one or more of the industrial needs specified above.
2) Each specialisation must be based on recognised expertise and facilities within the partner HEIs. Such recognition can take the form of World Leading and Internationally Excellent levels of standing in the Research Exercise Framework (REF) or some other form of independent recognition that is appropriate.
3) Each specialisation must either:
   a) have shown evidence of successful projects that generated results (jobs created, investment induced, products processes or services launched) under the ASTUTE Project 2010 to 2015, or
   b) be an emerging technology area with genuine potential or need (e.g. to address a potential future threat or opportunity coming from new technological developments) to generate these results for the ASTUTE 2020 Operation.

It is our intention that each specialisation will be monitored regularly by the Stakeholder Advisory Board of ASTUTE 2020, which will also include relevant sector Industrial Representatives. We will also re-assess our approach at a gateway after three years through a combination of the mid-term evaluation, stakeholder advice and a Horizon-scanning exercise. Particular emphasis should be placed here on those that are "emerging technologies" and re-assessing the current ones to ensure all areas of *Adaptive Smart Specialisation* continue to be relevant.

1.5.2 Smart and Adaptive

It should be emphasised at this stage that these Specialisations are both *Smart* and *Adaptive*.

They are *Smart* because (i) they are aligned with the Welsh Smart Specialisation Strategy as set out in the Science for Wales and Innovation Wales documents (aligned with the Grand Challenge Area of *Advanced Engineering and Materials)*, (ii) they are highly relevant to the needs of manufacturing industry in Wales, (iii) they are underpinned and developed further by world class expertise from the participating HEI institutions within Wales, (iv) they are proven to have economic impact as demonstrated by the previous ASTUTE, and (v) they will be achieved within a specific timeframe. Thus they offer optimal opportunities for targeting of the ERDF investment on areas that offer excellent economic opportunities.

They are *Adaptive* because as the operation progresses, we will conduct Horizon Scanning exercises to review industrial RD&I needs of Welsh companies, manufacturing trends across the globe and technology availability within Welsh HEIs. We may then develop these specialisations so that they can adapt to the changing demands of industry and new opportunities for innovation that may arise. Any change to the three specialisations will require consultation with the Stakeholder Advisory Board including its Industrial Representatives, and there will be a clear and robust mechanism to manage and monitor this process of adaptation. From here on, these specialisations will be referred to as *Adaptive Smart Specialisations*.

The benefits of an *Adaptive Smart Specialisation* approach include the fact that it maximises the

chances of transformational (rather than incremental) innovation because it will be focussed on world leading and internationally excellent expertise and facilities within Welsh HEIs, and it will be aligned to current edge technological developments and requirements.

Using the criteria described above we have determined that ASTUTE 2020 will focus its resources in order to concentrate on three Adaptive Smart Specialisations that are shown in Table 1.2. Each of these specialisations will address the Industrial Needs indicated.

Table 1.2 Adaptive Smart Specialisations for ASTUTE 2020 and Industrial Needs

Adaptive Smart Specialisation	Industrial Needs Addressed
Computational Engineering Modelling	The need to reduce costly "trial and error" approaches in enabling or improving manufacturing processes and manufactured products, and to increase understanding of complex processes and products.
Advanced Materials Technology	The need to introduce new materials into products, to adopt more innovative techniques for processing other advanced materials, and to better understand materials and their behaviour.
Manufacturing Systems Engineering	The need to develop processes or systems to enable sustainable products, services and supporting supply chains throughout the whole life cycle, and to exploit digital processes and connectivity in the manufacturing process.

We anticipate that each Adaptive Smart Specialisation will have a nominated leader with a team of a number of academics and associated project officers who will then stimulate collaboration across the University partnership, with resulting synergistic benefits for the manufacturing sector in WWV.

It is also worth mentioning here that these Adaptive Smart Specialisations address industrial RD&I needs across a diverse range of manufacturing sectors. The fact that no single specialisation is restricted to a single sector means that our approach will not be vulnerable to unforeseen economic shocks that disrupt a particular sector (e.g. the current decline in oil prices which could harm those manufacturing companies in the oil exploration supply chain).

A description of each of the three Adaptive Smart Specialisations now follows.

1.5.3 Computational Engineering Modelling

(Lead Academic – Professor David T. Gethin, Swansea University)

Manufacturing processes are influenced by a wide range of complex physical phenomena. Examples include transfer of heat, flow of gases and liquids, mechanical deformation of solids, flow of particles, interaction of fluids and structures, electromagnetic fields etc. In addition, the performance of manufactured components in their intended application will also be dependent on such phenomena. In other instances it is vital to better exploit the manufacturing technology used by

understanding the connection between design and manufacture.

Thus the commercial effectiveness of manufacturing is critically dependent on the ability to predict and understand such physical quantities and how they vary through the process, the component and associated tooling used in the production process. This is done using advanced mathematical modelling or numerical modelling techniques generating detailed models based on physical laws, equations and physical properties which can then be solved using appropriate computer systems.

Many advanced techniques exist now for computer modelling of engineering processes; these include the Finite Element, Finite Difference, Finite Volume and Discrete Element Methods or applied mathematical modelling techniques. With modern computer power these techniques can be applied in an increasing range of manufacturing and product scenarios across a variety of sectors.

Computational Engineering Modelling is essential in addressing the first identified RD&I need. Improving manufacturing processes and manufactured products often requires experimentation along a "trial and error approach". This can be costly in terms of staff time and materials and is often a lengthy process sometimes with an uncertain outcome. The predictive capabilities offered by this specialisation can reduce and/or eliminate the "trial and error" approach so that new products can have shorter lead times to market and new processes and products can be optimised with low risk and faster implementation times.

All computational modelling at some point will need experimental validation. This is done via extensive experimental work with data capture and analysis.

Swansea University will take the lead on this specialisation which will be based on the REF recognised expertise in the College of Engineering (see Appendix II for details). Swansea University has an international reputation for the development of Computational Engineering Modelling. The Finite Element Method was developed here by Professor Olgierd Zienkiewicz in the 1960s and has now been adopted worldwide as a key Engineering analysis tool.

There will also be contributions from Cardiff University and UWTSD to this specialisation. There have been many successful projects with companies in the area of Computational Modelling under ASTUTE generating significant impact. These have led to significant results such as jobs created, investment induced and products, processes and services launched in WWV.

1.5.4 Advanced Materials Technology

(Lead Academic – Professor Stephen G.R. Brown, Swansea University)

Understanding the behaviour of the materials used to manufacture components is a key area for ensuring efficient production and optimum performance of the component in service. The specialised technical expertise available from the partnership covers several classes of advanced materials, which include sophisticated multi-component metallic alloys, polymeric materials and elastomers, composites, semiconductors and digital materials. Our academics have the expertise to interpret macroscopic behaviour of these materials in terms of the underlying structures and phase transformations at the atomic scale. We have advanced techniques available for studying microstructures of materials. These include high resolution electron and optical microscopes,

Atomic Force Microscopes (AFM), Energy Dispersive X-ray Analysis and Secondary Ion Mass Spectroscopy (SIMS). We also have capabilities for studying bulk degradation mechanisms, such as fatigue, high temperature creep, embrittlement etc. and surface degradation mechanisms such as oxidation, corrosion and susceptibility to Ultra Violet light. These phenomena have a critical effect on component durability.

This Adaptive Smart Specialisation will thus address the Industrial RD&I need of improved knowledge and understanding of materials utilised in existing processes and products and of introducing new materials into products and processing existing materials more efficiently.

Swansea University's College of Engineering will take the lead on this specialisation. Appendix II highlights the expertise that was recognised in the 2014 REF. There will also be inputs from Cardiff University in this specialisation.

In the area of Advanced Materials Technology, collaboration with local companies has been extensive during ASTUTE. Successful, job-creating projects include the processing of high strength steels, high temperature cobalt alloys, lead free solders, composite tungsten alloys impregnated with diamonds for grinding aerospace components and surface activation of polymers.

1.5.5 Manufacturing Systems Engineering

(Lead Academic – Professor Mohamed Naim, Cardiff University)

The Manufacturing System Engineering approach is cross disciplinary to consider end-to-end processes or systems to develop sustainable products and services through the integrated application of knowledge, information, equipment, materials, energy, transport and people with the goal of optimising a product, process or service, and its supporting supply chains and logistics, throughout the whole life cycle.

Manufacturing Systems Engineering is critical to effective production processes. Examples of the expertise we have available here include: Systems Engineering, Operational Excellence, Manufacturing Process Improvement, Production and Inventory Control, Supply Chain Re-engineering and Re-shoring, Failure Modes Effects Analysis and Ontology, Biomedical Engineering, Resource Efficiency, Life Cycle Analysis, Circular Economy, Recycling and Sustainable Engineering Manufacturing and Supply Chains.

These are underpinning areas of expertise and are aimed at the industrial need of improving the use of resources in the manufacturing process and managing the supply chain of products and services entering the company.

Cardiff University will lead this specialisation through their School of Engineering and the Logistics and Operations Management Section of Cardiff Business School, which both performed strongly in the 2014 Research Excellence Framework (see Appendices II and II for details). There will also be contributions from Swansea University and Aberystwyth University in this specialisation.

This specialisation will build on successful, job creating projects in ASTUTE over the period 2010 to 2015.

1.5.6 Multidisciplinary Application of Adaptive Smart Specialisations

These three Adaptive Smart Specialisations are essential to support collaborative research with industry on specific topics, but they are also underpinning specific issues in a wide range of activities. Frequently, there will also be aspects from more than one smart specialisation needed to move a manufacturing process or manufactured product forward or to address a specific topic of interest to industry.

Additive Layer Manufacturing (ALM) is one such topic. ALM can be considered sophisticated variants of 3D printing where three dimensional components can be built up from very thin layers of material. This opens the route to manufacture complex free-form engineering components at the metre scale. The digital nature of the process allows fabrication of parts that cannot be fabricated by other processes making efficient use of materials such as advanced alloys that are often expensive. However, the process is not technically mature, design rules for this process have not yet been fully established and application requires significant research input to achieve a successful result. There are numerous research challenges around the process and the materials especially when processing metals. ASTUTE 2020 can support further development of this innovative manufacturing process working with the local supply chain and end users using its expertise from the areas of Advanced Materials Technology and Computational Engineering Modelling.

Digital materials manufacture falls also into this category, where the computational and the material world is brought together delivering functional materials in the sense that the materials are not homogenous, but have internal structures which give rise to functionality beyond that of the base material.

Another example of cross-smart specialisation work is smart manufacturing related work combining cyberphysical systems, simulation, 3D visualisation, sensor technology, data collection, analytics, decentralised decisions and monitoring physical processes within modular structured Smart Factories. Other areas deal with connectivity, relating to “Big Data”, “Internet of Things” and “Internet of Services” which were highlighted as key global megatrends in the Horizon Scanning report for ASTUTE carried out by GWOS consulting. These topics require support from the Adaptive Smart Specialisations Computational Engineering Modelling and Manufacturing Systems Engineering and ASTUTE 2020 can support some selected, specialist aspects of this at the relevant TRL/MRL levels.

1.6 Focus and Concentration

Relative to the original ASTUTE project 2010 to 2015, the use of Adaptive Smart Specialisations for ASTUTE 2020 represents a significant concentration of resources in a smaller number of technical areas with high economic impact potential. This section describes how we have arrived at this more focussed configuration.

The ASTUTE business plan developed from 2008 to 2010 highlighted a number of business drivers which gave rise to 15 different technology areas. Over the course of the ASTUTE project we have monitored the industrial demand for these technology areas and also considered which of these have led to the most successful results in terms of economic impact in WWV.

This analysis has involved recording where each of the 15 technology areas has been used for each company, in order to give an overall indication of both industrial *demand* and *economic impact*.

We have interacted with a large number of companies; some of these have proceeded to Enterprise Assists and some to full Collaborative Projects. It is helpful to consider where each technology area has contributed to each of these to demonstrate *demand*.

In addition to evidencing demand, it is also possible to demonstrate where these technologies have economic *impact* in terms of the three most important impact related result indicators, (i) Jobs created, (ii) Investment Induced and (iii) New or Improved Products Processes and Services Launched (PPSL). Figure 1.1 presents the results of this analysis.

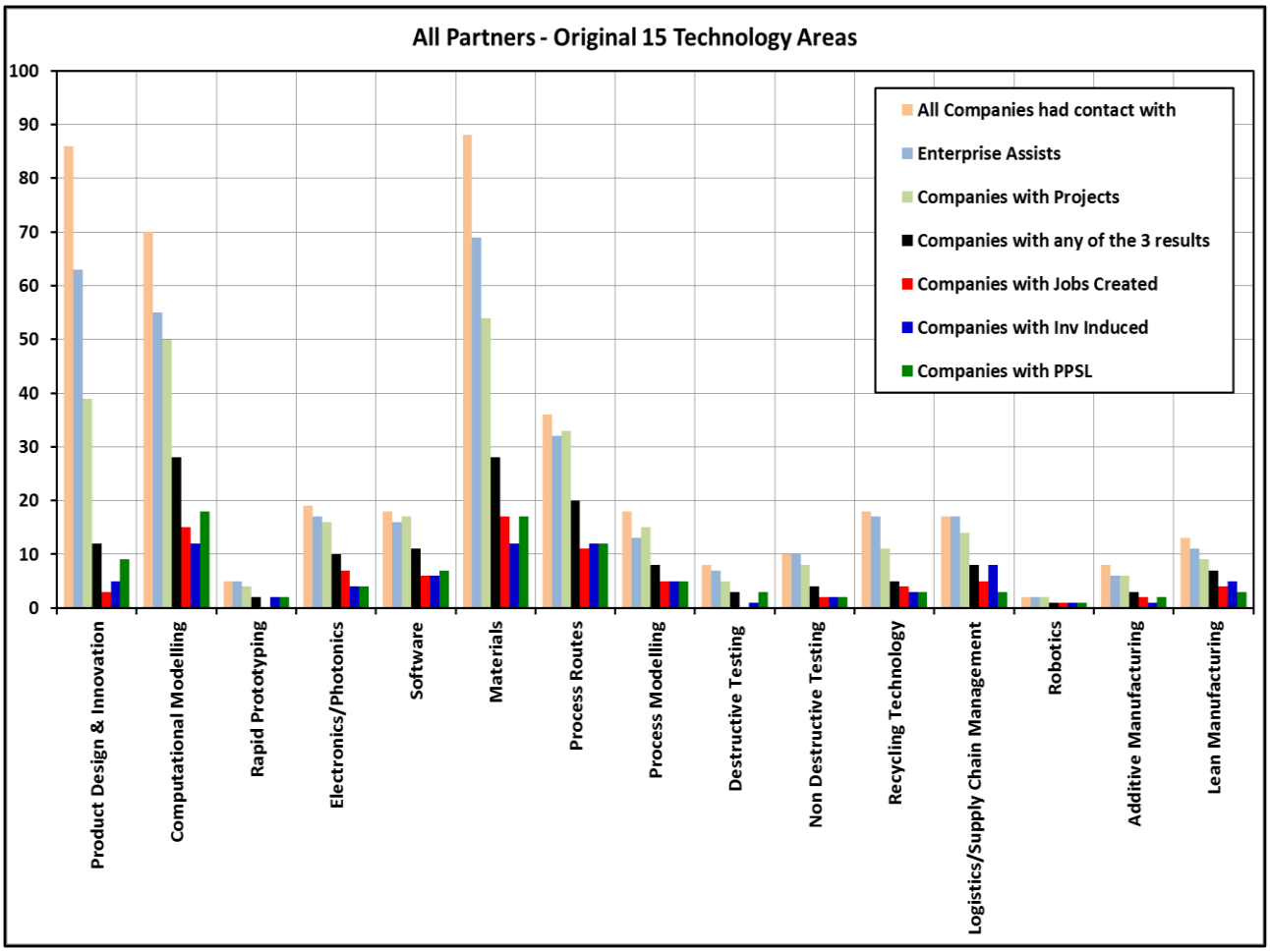

Figure 1.1 Industrial Demand and Economic Impact resulting from the original 15 technology areas defined in the Business Plan for ASTUTE in 2010.

There are a number of useful observations that can be made from this graph:

- "Product Design & Innovation" has demonstrated high demand, with many enquiries, enterprise assists and projects undertaken, but very little economic impact in terms of results. More detailed examination of the results shows that the demand in this area originated from very small embryonic companies. This specialisation, despite high demand from SMEs does not represent best use of ERDF funding and will not be a specialisation in

ASTUTE 2020.

- A number of other technology areas, such as "Rapid Prototyping" and "Destructive Testing" have shown near zero demand and impact. Furthermore, as they cannot be regarded as emerging technology areas, we will not offer these as part of our Adaptive Smart Specialisations in ASTUTE 2020.

- "Computational Modelling" and "Materials" have demonstrated high demand and are the two areas with the greatest levels of economic impact in terms of jobs, investment and PPSL. Hence these two areas will be essential to form the basis for the *Computational Engineering Modelling* and *Advanced Materials Technology* Adaptive Smart Specialisations.

- "Process Routes" has shown good demand and good economic impact; it is also closely related to the "Logistics and Supply Chain Management" and will thus form the basis of the *Manufacturing Systems Engineering* Adaptive Smart Specialisation.

Therefore, based on the above analysis, we have narrowed down the original 15 technology areas into just three specialisations as indicated in Table 1.3.

Table 1.3 Concentration of 15 Technology Areas into three Adaptive Smart Specialisations

Original Technology Area in current ASTUTE	Relevance to ASTUTE 2020 Adaptive Smart Specialisations
Product Design & Innovation	In ASTUTE 2020 this will be signposted as appropriate.
Computational Modelling	This will form the basis of ***Computational Engineering Modelling.***
Rapid Prototyping	In ASTUTE 2020 this will be signposted as appropriate.
Electronics/Photonics	In ASTUTE 2020 this will be signposted as appropriate.
Software	In ASTUTE 2020 this will be signposted as appropriate.
Materials	The focus will now be on ***Advanced Materials Technology.***
Process Routes	Common themes of underlying science have been extracted that are relevant to ***Manufacturing Systems Engineering.***
Process Modelling	Common themes of underlying science have been extracted that are relevant to ***Computational Engineering Modelling.***
Destructive Testing	In ASTUTE 2020 this will be signposted as appropriate.
Non Destructive Testing	Common themes of underlying science have been extracted that are relevant to ***Computational Engineering Modelling.***
Recycling Technology	In ASTUTE 2020 this will be signposted as appropriate.
Logistics/Supply Chain Management	Common themes of underlying science have been extracted that are relevant to ***Manufacturing Systems Engineering.***
Robotics	Common themes of underlying science have been extracted that are relevant to ***Manufacturing Systems Engineering*** and ***Computational***

	Engineering Modelling
Additive Manufacturing	Common themes of underlying science have been extracted that are relevant to ***Advanced Materials Technology*** and ***Computational Engineering Modelling.***
Lean Manufacturing	In ASTUTE 2020 this type of work will be signposted as appropriate.

We would like to emphasise that in conducting this process we have not amalgamated old areas into a smaller number of new areas. There are a limited number of cases where we have extracted common themes of underlying science from some of the original technology areas in ASTUTE; we have done this only where these themes are relevant to the Adaptive Smart Specialisations of ASTUTE 2020.

We are very grateful for the help from Industry Wales in considering areas of demand and industrial needs for manufacturing in WWV. After extensive consultation, we gave a presentation to Industry Wales in February 2015, and following further discussions Industry Wales have confirmed, in a letter of support (Appendix XIII), that our chosen Adaptive Smart Specialisations are highly relevant to Industry in WWV at the present time.

1.6.1 Selection of the Partner Universities for ASTUTE 2020

The Research Excellence Framework 2014 results have been used to help shape the partnership for ASTUTE 2020, so that the Operation is focussed on collaborations underpinned by world leading and internationally excellent research.

Wales can claim to have two of the top ten UK Universities for Engineering Research. The Research Excellence Framework results show that Cardiff are ranked 5th and Swansea 10th according to the weighted average GPA scores for the four Engineering Units of Assessment. For a nation with only 5% of the UK population, this is an outstanding achievement.

Swansea and Cardiff will thus form the core of the ASTUTE 2020 partnership. This consortium can be further aided by the complementary support of other internationally excellent schools with other specialist manufacturing expertise being drawn upon from across the Welsh HE Sector. Appendix I presents details of the REF results for the relevant Units of Assessment at each potential ASTUTE 2020 partner, and this information is summarised in Figure 1.2.

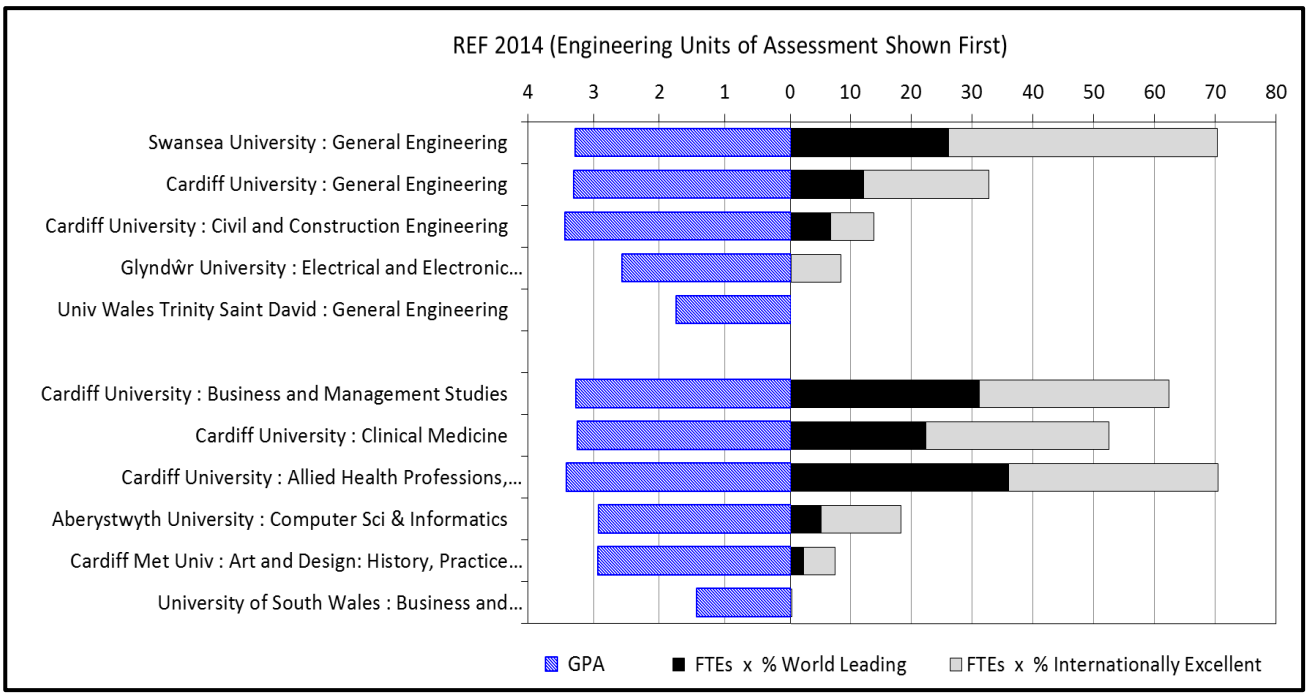

Figure 1.2 Research Excellence Framework (REF) results for the Units of Assessment associated with the potential partners for ASTUTE 2020

This figure shows the results in terms of two separate measures. On the left is the Grade Point Average (GPA) which is a measure of the quality of research on a scale of 0 to 4. On the right, the percentage of World Leading and Internationally Excellent is multiplied by the number of FTE staff submitted for each unit to give a combination of size and quality called power of research. The Engineering Units of Assessment are presented first as ASTUTE 2020 will be primarily concerned with Engineering. However, there are also a number of other areas of expertise that are relevant to manufacturing and these are also included.

We have analysed the areas of expertise offered by the respective partners, the area of Adaptive Smart Specialisation that it fits under, whether this area of expertise is strongly related to manufacturing, strong industrial demand and potential impact of these areas of expertise in the past ASTUTE project, the partner's REF excellence, and whether there is stronger REF excellence in this area in the partnership already. This reconsideration of the ASTUTE 2020 partnership with a view of focus and higher impact informs the decision of which partners with niche expertise areas can contribute to the work of the partnership together with Swansea and Cardiff Universities. Table 1.4 shows this analysis.

Table 1.4 Selection of smaller HEI partners for ASTUTE 2020

CEM = Computational Engineering Modelling
AMT = Advanced Materials Technology
MSE = Manufacturing Systems Engineering

Partner	Niche area expertise offered	Adaptive Smart Specialisation	Area of expertise strongly related to manufacturing	Industrial demand	Impact in ASTUTE	REF excellence	Duplication with areas of expertise from partner with stronger REF in this area	Partner for ASTUTE 2020
Aberystwyth	Software Systems for Manufacturing	MSE/ CEM	**YES**	**YES**	**Medium**	**YES**	**NO**	**YES**
Bangor University	Product Design	-	**NO**	**weak**	**None**	**YES**	**NO**	**NO**
Cardiff Metropolitan University	Service Innovation, Eco Design	MSE	**NO**	**YES**	**Medium**	**YES**	**NO**	**NO**
Glyndŵr	Composites	AMT	**YES**	**limited**	**Weak**	**NO**	**NO**	**NO**
Glyndŵr	Computational Engineering Modelling (General)	CEM	**YES**	**YES**	**Weak**	**NO**	**YES (Swansea)**	**NO**
University of South Wales	Manufacturing Process Improvement, Supply Chain Re-engineering	MSE	**YES**	**YES**	**Strong**	**NO**	**YES (Cardiff)**	**NO**
UWTSD	Computational Engineering Modelling (NDT)	CEM	**YES**	**YES**	**Strong**	**NO**	**NO**	**YES**

Selecting the partnership by evaluating the criteria above, we propose the partnership for ASTUTE 2020 to be:

- Swansea University,
- Cardiff University,
- Aberystwyth University, and
- University of Wales Trinity Saint David

Tables 1.5 and 1.6 emphasise the extent of the focus and concentration, from 15 technical areas

spread across eight partners in ASTUTE 2010-2015 down to three Adaptive Smart Specialisations in four partners for ASTUTE 2020.

Table 1.5 Contribution of the 8 HEIs to the 15 Technology Areas that were originally specified in the Business Plan for ASTUTE 2010 to 2015

	Aberystwyth	Bangor	Cardiff	Glyndwr	Newport	Swansea	SMU	UWIC
Product Design & Innovation			●			●		●
Computational Modelling		●				●		
Rapid Prototyping			●					
Electronics/Photonics		●			●			
Software	●					●		
Materials				●		●		
Process Routes						●		
Process Modelling						●		
Destructive Testing						●		
Non Destructive Testing							●	
Recycling Technology						●		
Logistics/Supply Chain Management			●					
Robotics			●		●			
Additive Manufacturing		●				●		
Lean Manufacturing			●					

Table 1.6 Contributions of the 4 HEIs to the three Adaptive Smart Specialisations for ASTUTE 2020

	Swansea	Cardiff	Aberystwyth	UWTSD
Computational Engineering Modelling	●	○		+
Advanced Materials Technology	●	○		
Manufacturing Systems Engineering	○	●	+	

● ***Major contribution / Lead partner in this area***

○ ***Will make significant contribution in this area***

\+ ***Will make smaller contribution in this area***

Appendix II provides details about the partners and the role they will play in the Adaptive Smart Specialisations.

1.7 Contribution to the ERDF Operational Programme for WWV

In relation to the ERDF Operational Programmes for WWV[5], ASTUTE 2020 will deliver under ERDF Priority 1 (Research and Innovation) and is aligned with Specific Objective 1.2 "To increase the successful translation of research and innovation processes into new and improved commercial products, processes and services, in particular through improved technology transfer from HEIs."

Our approach of demand-led collaborative research with WWV manufacturing companies will enable significant levels of technology transfer to, and innovation within, those enterprises. They can then move into higher value operations and launch new and improved products, processes and services which will enable them to compete more effectively in the relevant markets.

In addition, we will also encourage the localisation of High Value Manufacturing supply chains within WWV through utilising our extensive and growing network of industry partners. We also anticipate some opportunities for new start-up companies to be formed.

All of these outcomes will lead to an increase in *RD&I activities* in companies, their *commercialisation* and therefore also an increase in *turnover* of WWV businesses related to manufacturing (these companies represent the *target group* that ASTUTE 2020 will focus on). The *average percentage share of total turnover that results from innovation* will therefore also increase.

[5] ERDF West Wales and the Valleys OPERATIONAL PROGRAMME 2014-2020, Welsh European Funding Office, December 2014, CCI (2014UK16RFOP005)

This particular indicator is one of the key desired results for Specific Objective 1.2.

1.7.1 Alignment with the Targeting Principles

Specific Objective 1.2 has a number of targeting principles[6]. These are listed in Table 1.7, which explains how ASTUTE 2020 is aligned with these.

Table 1.7 Alignment of the proposed ASTUTE2020 operation with the targeting principles for Specific Objective 1.2 of the ERDF Operational Programmes

Targeting Principles	ASTUTE Alignment
Must be aligned with *Innovation Wales* (and *Science for Wales*) as part of demonstrating smart specialisation.	ASTUTE 2020 is very well aligned with Wales' Smart Specialisation strategy as outlined in Science for Wales and Innovation Wales. Further details are outlined in section 1.9. Furthermore, the operation will have an Adaptive Smart Specialisation approach at its core informed by stakeholder, industrial and external independent expert advice by harnessing the best manufacturing related expertise from within Welsh Universities for the economic benefit of the region.
To deliver the result indicator, investments should focus on the launch and commercialisation of new products, processes and services by Welsh businesses.	Our collaborations with WWV manufacturing companies will focus on using our Adaptive Smart Specialisations to create innovation that will lead to the launch and commercialisation of new products, processes and services. The resulting revenue streams will deliver an increase in the share of total turnover from product innovation. This is the result indicator specified by WEFO for Specific Objective 1.2.
Benefits need to be captured in Wales and be reflected in turnover of Welsh businesses.	The fact that we will be working with companies or their operational bases in WWV means that benefits will clearly be captured in WWV and contribute to the turnover of WWV businesses, especially when collaborating with locally rooted companies.
Identify international links/partnerships, including potential transnational activity.	As mentioned earlier, we will be looking to set up transnational knowledge exchange activities. We already have extensive networks of national and international links and we will use these to support the partnership's activity in WWV and to bring in 'outside expertise' as and when appropriate for the benefit of

[6] European Structural Funds Programmes 2014-2020, A Summary of the ERDF and ESF Structural Fund Programmes in Wales, Welsh European Funding Office, Version 3, January 2015, page 12.

	WWV industry.
Collaboration opportunities should consider potential for industrial-led collaboration and involvement, rather than solely related to HEIs	Our stated aims are to carry out collaborative research with qualifying companies, and this will be informed and driven by the demand from manufacturing industry. Collaboration with industry is thus central and essential to the aims and delivery of ASTUTE 2020.
Links to other programmes should be considered – as a minimum ESF and H2020	We will establish links with other programmes, including WG owned programmes, such as the SMART Operations. As described later in this section, these will include ESF operations (such as the Materials and Manufacturing Academy which is proposed to run in parallel with ASTUTE 2020). We will also consider the potential to leverage in funds from Horizon 2020 and other funding streams for the benefit of the Welsh Economy.

1.8 Alignment with the Economic Prioritisation Framework (EPF)

ASTUTE 2020 could represent a "Backbone" or "core activity" in the sense that it will deliver the *Knowledge Infrastructure* described on page 9 of the EPF[7] as follows:

- It will deliver **collaborative research** between academia and businesses in WWV.
- It will deliver greater levels of **business innovation** across several sectors related to manufacturing, including but not limited to automotive, aerospace, medical, low carbon economy etc.
- It will stimulate the increased **commercialisation of existing research**.
- It will develop **emerging specialisations and clusters** using an Adaptive Smart Specialisation approach.

1.8.1 Thematic Economic Opportunity – Advanced Manufacturing

Of the seven thematic economic opportunities described in the EPF, ASTUTE 2020 is principally aimed at *Advanced Manufacturing* and will link with most of the key drivers for this area. The proposed operation will work closely with high value manufacturing firms and their supply chains to

(i) generate innovation leading to new and improved products, processes and services and

(ii) encourage repatriation of supply chains back to WWV from overseas.

[7] The Economic Prioritisation Framework for Welsh European Funds: A Guidance Document providing an Investment Context for the Implementation of EU Programmes in Wales, Version 2: March 2014

ASTUTE 2020 will contribute to the further development of a Welsh Innovation Ecosystem in Advanced Engineering and Manufacturing that can promote a *Circular Economy* by focussing on the more efficient use of resources by the manufacturing sector.

One of the *Key Demand Drivers* here is that some Anchor and Regionally Important companies are part of the Advanced Manufacturing sector and the successful collaborations under the previous ASTUTE project will be extended further to enable us to work with companies that we have not yet collaborated with. The ASTUTE 2020 network with its world-class expertise in advanced manufacturing offers substantial opportunities to also collaborate with companies in the most relevant Enterprise Zones, namely Ebbw Vale, Haven Waterway and Snowdonia based in WWV.

The previous ASTUTE project is described as an *Existing Capability* and Centre of Excellence for RD&I in this theme in the most recent draft of the EPF[8]. ASTUTE 2020 will build on the existing capacities and capabilities in the network of Welsh partner universities. The operation will encourage and efficiently facilitate collaborative research between academia and businesses which has been identified as a core activity for Knowledge Infrastructure and directly address "thematic economic opportunities" as defined in the EPF[9]. Discussions are underway to work more closely with the WG SMART Operations in order to maximise the benefit for WWV industry. Placing a greater emphasis on strategic, larger scale projects (SLSPs) developed in a bottom up approach from Adaptive Smart Specialisation inspired by industry needs possibly involving multiple ASTUTE 2020 partners and elements of the supply chain for specific sectors will allow ASTUTE 2020 to work more strategically and thereby contribute considerably to the wider sector development.

We originally considered that there may be an opportunity for ASTUTE 2020 to collaborate with the High Value Manufacturing (HVM) Catapult[10]. This organisation is distributed across seven centres in the UK, and was set up with and continues to receive substantial funding from Innovate UK (Technology Strategy Board). Its aim is to bridge the gap between early innovation, where the UK has traditionally been strong, and industrial-scale manufacturing, where real wealth is created and the UK is relatively uncompetitive.

Following our initial approach to the HVM, it appeared that there could be scope to work together with significant benefits for both partners. However, after more detailed discussions it became apparent that HVM Catapult now has to focus its activity on increasing its income, rather than collaborative ventures. So this would not really be a two-way collaboration resulting in a very much limited economic impact for WWV and therefore it was not advantageous to pursue this route. Consequently, we do not currently have an agreed mechanism for working with the HVM at the moment, but we will keep the dialogue open and explore future possibilities.

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[8] The Economic Prioritisation Framework for Welsh European Funds: A Guidance Document providing an Investment Context for the Implementation of EU Programmes in Wales, Version 2: March 2014

[9] The Economic Prioritisation Framework for Welsh European Funds: A Guidance Document providing an Investment Context for the Implementation of EU Programmes in Wales, Version 2: March 2014

[10] https://hvm.catapult.org.uk/

In addition to *Advanced Manufacturing*, there will also be some secondary relevance to the thematic opportunities of *Energy*, *Life Sciences/Health* and *ICT* where there are requirements for the manufacture of technologically complex devices. Examples here include the manufacture of components for wind or tidal turbines, manufacture of advanced medical instruments/diagnostics for use by clinicians and the incorporation of the "Internet of Things" philosophy into manufactured components (e.g. miniature sensors to detect component damage etc.).

1.8.2 Regional Economic Opportunities

In terms of regional support, the proposal is aligned with all three regions, and we have started and will continue the dialogue with the appropriate bodies, namely:

- The North Wales Economic Ambition Board
- The Swansea Bay City Region Board
- The Cardiff Capital Region Board

We have invited these three bodies along with the EEF and Industry Wales, to sit on the Stakeholder Advisory Board (SAB) for ASTUTE 2020. All of them have agreed to be part of the SAB and most of them have attended the first SAB meeting on 14th October 2015.

1.9 Alignment with Welsh Government Policies

ASTUTE 2020 will be very much in line with the policies of the Welsh Government. The relevance to the *Science for Wales* and *Innovation Wales* documents is described below.

1.9.1 Science for Wales

In developing this proposal for ASTUTE 2020 we have taken into account the strategic agenda for Science and Innovation in Wales. The Welsh Government's vision recognises the vital links between the research and science skills base in Wales, and the processes of innovation, development and commercialisation that transform scientific outputs into economic advantage for Wales.

The *Science for Wales*[11] document has identified three *Grand Challenge* priority areas:

1) Life sciences and health
2) Low carbon, energy and environment
3) Advanced engineering and materials

Of these three, ASTUTE 2020 will be primarily aligned with *Advanced Engineering and Materials*. There are many examples of company collaborations under ASTUTE in different sectors relating to

[11] Science for Wales: A strategic agenda for science and innovation in Wales, Welsh Government, 2012, ISBN 978 0 7504 7150 3, WG14478

High Value Manufacturing in relevant areas of industrial applications.

We will also be well placed to exploit the exciting multidisciplinary opportunities between these Grand Challenges. For example, previous collaborations in ASTUTE have researched engineering simulations of medical devices such as heart pumps and blood oxygenators, which lie at the intersection of (1) and (3). Further examples at the intersection of (2) and (3) include collaborations focussing on manufacturing engineering aspects of novel wind turbine designs and effective recycling strategies for advanced materials.

Section 3.3 (page 18) of the *Science for Wales* document is of particular significance as it deals with the use of EU Structural Funds. ASTUTE 2020 will support the aims of increasing the industrial and R&D competitiveness of Wales. Our focus will be on "closer to market" research with well-defined business aims, typically centred on applied research.

Science for Wales also emphasizes the need for excellence in research, coupled with the resulting economic impact (page 18). ASTUTE 2020 will therefore have a strong focus on the excellence of research carried out with companies and this will influence (i) the distribution of funds between the HEI partners, and (ii) the way potential company projects are reviewed and prioritized by the senior academics and relevant outside experts. This expert review process (further described in the section on *Delivery*) will also consider potential economic impact, the potential for transformational change within the collaborating companies, and will look at opportunities for leveraging in other external funds, such as those associated with Horizon 2020 and Innovate UK (including KTPs).

1.9.2 Innovation Wales

The Innovation Wales [12] document has highlighted the need for more collaboration between businesses, academia and others who access UK and EU funding streams. It is recognised that universities and colleges need not only to continue to break new ground through original research but also to collaborate productively with others to turn ideas and technology into economic gain (as described in the foreword).

Improving Collaboration is the first of the five key themes of this strategy document. Furthermore, Action Area 2 (page 21) states that "Knowledge exchange and commercialisation of R&D will be given a high priority in Wales and will favour a demand led approach."

ASTUTE has always been very much focussed on demand led collaboration with manufacturing companies for process and product increased understanding and improvement, which was demonstrated in the feedback from companies in the independent ASTUTE Final Evaluation[13]. We will enhance and refine this approach of responding to the needs of these businesses in the collaborative RD&I projects that we will carry out under ASTUTE 2020 using Adaptive Smart Specialisation for increased impact.

[12] Innovation Wales, Welsh Government, 2014, Print ISBN 978 1 4734 0917 0, Digital ISBN 978 1 4734 0915 6, WG18875

[13] Report on the Final Evaluation of ASTUTE, "Final Evaluation Report for the ASTUTE (Advanced Sustainable Manufacturing Technologies) Project" carried out by Ciotek, June 2015.

The second theme is *Promoting a Culture of Innovation*, where companies need to look for new ideas and solutions outside their own organisation. ASTUTE 2020 will be ideally placed to contribute to this theme, as it will be able to access focussed world-class expertise from several partner Universities in Wales.

Innovation Wales also refers to a fourth Grand challenge area: *ICT and the digital economy*. While this is not the primary focus of ASTUTE 2020, we will nevertheless be able to contribute to novel digital fabrication techniques that are becoming increasingly relevant to new manufacturing processes and systems.

1.10 Addressing the Cross Cutting Themes

Over the period 2010 to 2015, ASTUTE recognised the importance of the EU Cross Cutting Themes of Equal Opportunities and Environmental Sustainability. We appointed a specialist person to deal with these themes, both internally within the partner Universities and externally within the Collaborating Companies. We have exceeded the original targets specified for "Enterprises adopting or improving Equality Strategies and Monitoring Systems" and "Enterprises adopting or improving Environmental Management Systems". Furthermore, we have liaised extensively with the WEFO Cross Cutting Themes representatives and have been encouraged by the level of positive feedback on our approach.

We understand that WEFO are keen to centralise support for Cross-Cutting Themes for the current programme and we will actively engage in this process. Further details of this are included in the section on Cross Cutting Themes.

1.11 Integration with other funding streams

In order to maximise the benefits of structural funds for the Welsh economy it is essential to ensure complementarity of different operations and collaboration with other funding streams and investments. We see a number of opportunities for integration with other operations under the ESI funding programmes, or other funding streams and investments. Discussions with several other organisations have already taken place as outlined below. Going forward we will aim to schedule frequent meetings with the management of the most pertinent operations like e.g. WG SMART Innovation and Expertise and the Materials and Manufacturing Academy to exploit synergies and shape the reciprocal operations throughout their duration. With further development of the 2014 – 2020 programme there will be other operations where close interaction and integration will be vital. In addition to repeated meetings with the management, meetings for the 'technical staff' will be vital for reciprocal awareness and understanding of each other's aims and delivery and to ensure intelligent signposting and we are looking to organise workshops for liaison and exchange of best practice.

1.11.1 Links to other ERDF operations

We are aware of the potential for other initiatives seeking to support industry through technology transfer. It is important that the needs of industry are provided for and in anticipation of potential synergies we have proactively contacted other providers to understand what services they may be

offering and also to explain what assistance ASTUTE 2020 is aiming to provide. We have already contacted several key providers including TWI, SMART Innovation, SMART Expertise and SMART Cymru in areas that could potentially deliver complementarity with ASTUTE 2020. Examples of how some of these interactions have helped shape ASTUTE 2020 are as follows:

1.11.1.1 TWI Centre for Non Destructive Testing

Non-destructive testing is a key technology area aimed at monitoring and ensuring integrity of engineering components during actual service life (and just prior to entering service). This contrasts with ASTUTE 2020's focus on the actual manufacturing process and on engineering components. We met with [Information Redacted – section 40 (2)] at TWI in Port Talbot on 7th November 2014 and agreed that there will be potential for collaboration between our respective operations. Further discussions will be essential as both operations develop to ensure that both operations will signpost relevant RD&I projects to each other and potentially collaborate on suitable RD&I projects. UWTSD's strong involvement with TWI will facilitate this collaboration. TWI have also indicated that they will be prepared to work closely with the Materials and Manufacturing Academy for training of Engineering Doctorates.

1.11.1.2 FLEXIS

FLEXIS is a proposed ERDF Operation within Specific Objective 1.1 that will focus on the development of an energy systems research capability in Wales. We have engaged with the staff preparing this proposal and we both agree that ASTUTE 2020 and FLEXIS do not conflict and that there is no overlap. There may be opportunities for the two Operations to signpost work to each other and to also engage on a recurrent basis. Confirmation of this is presented in Appendix V.

1.11.1.3 IMPACT and Computational Foundry

IMPACT and Computational Foundry are Operations proposed by Swansea University in Specific Objective 1.1, and will be "centres of excellence" rather than delivering under Specific Objective 1.2 in the way ASTUTE 2020 will. Again there will be complementarity with ASTUTE 2020 and we anticipate opportunities for technical benefits to be transferred between the operations and their different TRLs at which they operate We plan to hold meetings with these operations and will set up an internal cross-referral mechanism that will operate within the College of Engineering and also for the wider STEM (Science, Technology, Engineering and Mathematics) subjects at Swansea University.

1.11.1.4 Welsh Government 'SMART' Operations

We initiated a meeting with [Information Redacted – section 40 (2)] from the Welsh Government on 19 November 2014 to start the dialogue and gain an improved understanding of our respective proposed operations. We are anticipating close liaison with the SMART Innovation team whose network of Innovation Managers will be ideally placed to be the first point of contact to signpost relevant industry projects to ASTUTE 2020.

As the operations have been developed further since then we arranged two follow-up meetings in August and November 2015 to discuss details of the operations and decide on a referral strategy. These were very positive and we now have a good understanding of how we can work together. The activities they will be pursuing will be along the lines of diagnostics for companies together with

signposting the company to other sources of help. SMART Innovation will not have substantial targets for indicators such as employment increase, private investment etc. This means that they will be very complementary to ASTUTE 2020 activities, and it was mutually felt that there should be extensive scope for working together. A one day workshop on the 8th October 2015 was organised that provided opportunities for the ASTUTE 2020 team, the Innovation Specialists and the SMART Expertise and SMART Cymru teams to meet, discuss details of the operations and refine the bi-directional referral mechanism further.

The SMART teams have met with ASTUTE 2020's technical managers and visited the facilities in Swansea and Cardiff Universities to ensure full awareness of each other's activities and bi-directional signposting of relevant projects. We have met with the SMART Innovation IP specialist, [Information Redacted – section 40 (2)], and have gained an understanding of the service being offered and how this would benefit ASTUTE 2020's industrial collaborators. The dialogue will be ongoing as the operations develop to enable maximising support for the Welsh industry through referrals from both parties. The first referrals have already taken place and we will keep each other informed about progress with referred companies. The WG Director of Innovation, David Rosser, [Information Redacted – section 40 (2)] from the Advanced Materials and Manufacturing Sector panel are part of ASTUTE 2020's Stakeholder Advisory Board and will ensure that ASTUTE 2020 aligns with WG activities in this sector.

We have already engaged with other structural funds operations like SEACAMS, LCRI, Seren and HPC Wales in the previous ASTUTE and will develop a more detailed dialogue as outlined above over the proposed lifetime of ASTUTE 2020 to discuss possible collaborations, and to identify and avoid duplication. In our many discussions we have found complementarities rather than overlap and with further development of new operations we will identify other initiatives where closer collaboration would be beneficial. These interactions will be monitored over the lifetime of the proposed ASTUTE 2020 project by the Operation Manager and will be reported to the Executive Management Committee.

1.11.2 Links to ESF operations

We can see several possible links with ESF operations such as the Materials and Manufacturing Academy (M2A), M2ETAL, Knowledge Economy Skills Scholarships (KESS) and other Work Based Learning Programmes.

1.11.2.1 Materials and Manufacturing Academy and M2ETAL

In parallel with the proposed ERDF funded ASTUTE 2020 operation, Swansea University has been awarded ESF support for a complementary operation termed the "Materials and Manufacturing Academy".. This will involve post graduate skills development in technology areas relevant to advanced manufacturing. It will thus underpin a sustainable technology embedding process into industry. A significant number of companies that we have collaborated with through ASTUTE have expressed support for this complementary activity and we are in the process of identifying the most suitable approach to properly embed additional high level knowledge in manufacturing companies. Collaboration with companies would be possible in concentrated ASTUTE 2020 led projects, while long term EngD type projects funded via the M2A could run along these with Project Officers, academics, industrialists and EngDs working together in related areas with the same company

forming a team of critical mass for a specific activity.

It is anticipated that ASTUTE 2020 and the M2A will be part of a pan Wales Innovation Eco System in Advanced Engineering, Manufacturing and Materials. This will drive the technical development of Advanced Engineering, High Value Manufacturing and Advanced Materials in Wales, thereby enabling Welsh industry to respond to global disruptive manufacturing trends and be internationally competitive, and Welsh Academia to attract national and international RD&I investment and collaborate globally. For this Innovation Eco System to work, it will need to encapsulate not only physical spaces and cutting-edge equipment but it also requires highly skilled people and these in sufficient numbers, training provision, deployment organisation(s), supporting functions and specifically designed interventions to promote the cultural change required and result in transformational rather than incremental impact on the Welsh economy. The proposed M2A will deliver this essential, high level skills and knowledge transfer. We are also looking to work closely with the work-based learning operation M2ETAL that will aim to embed knowledge in manufacturing and materials into WWV companies. All three operations are very complementary and best-placed for inter-operational referrals.

1.11.2.2 Other ESF schemes

It is likely that there will be several other opportunities to work interactively with other ESF schemes. In the past we have worked with representatives of the Access to Masters (ATM, which we understand will not be funded anymore) and KESS postgraduate training projects, helping to identify suitable companies that could benefit from assistance through these schemes. We have also consulted with operations such as the ION operation at Swansea University, identifying potential companies that could be referred between the operations on a reciprocal basis. We are also aware of the early stage ESF application for supporting STEM FdEng programmes and we would be looking to closely working with this operation for the benefit of the participating companies.

1.11.3 Links to Horizon 2020 and other EU funding streams

Swansea University and many of the other HEI partners will be considering applications to Horizon 2020 and other funding streams like Innovate UK and the Ireland-Wales Co-operation Programme.

- The majority of these bids would be separate from ASTUTE 2020. However, the fact that we will be working with a large number of manufacturing companies through ASTUTE 2020 provides an excellent opportunity to involve some of those companies in the Horizon 2020 programme and thus to effectively leverage further EU funding into businesses in Wales.

- The ASTUTE 2020 academics in the Welsh HEIs will also actively engage in preparing funding applications and working with EEN Wales to include Welsh companies in applications to Horizon 2020, Innovate UK and the Ireland Wales Co-operation Programme.

1.11.4 Links to Other Schemes and Private Sector

We have had discussions with the High Speed Sustainable Manufacturing Institute (HSSMI) who have been in contact with the Welsh Government regarding the possibility of funding for their

scheme. Essentially, HSSMI is a commercial, not for profit organization that has grown out of Loughborough University with the aim of working with manufacturing companies in the UK and Europe. They provide research and a range of engineering products and services to companies who join as members. Our discussions with them have been interesting and we can see where there would be areas of complementarity. Recent developments indicate that HSSMI will not be looking to work in Wales but we will keep this dialogue open to see if there are future areas of mutual benefit.

We have had extensive discussions with EEF, the Manufacturer's Organisation and their branch here in Wales. EEF describes itself as the voice of UK manufacturing and engineering and a leading provider of business support. EEF wants manufacturing industry, and businesses, to be able to thrive, innovate and compete both locally and on a global scale. EEF promotes and supports enterprise and innovation in the UK while making sure businesses remain compliant, future-focused and competitive. EEF also represent the engineering design service providers sector where, at a first glance, there could be a perceived overlap with ASTUTE 2020 activities. In order to minimise any risk of overlap with the private sector and discuss collaboration, sub-contracting and referral opportunities, EEF are part of ASTUTE 2020's SAB together with Industry Wales.

1.11.5 Locations of the Operation

The Swansea part of ASTUTE 2020 is being housed in Engineering Central on the new Bay Campus. This is a £450 million development on the Eastern approach to Swansea, which will provide the manufacturing development, innovation and demonstration facilities required for helping Welsh industry to stay sustainable and globally competitive.

Swansea University's ambition is to create a new world-leading research, innovation and educational complex. The University is realising its ambition with the creation of the Bay Campus, one of the largest knowledge economy projects in the UK and within the top five in Europe. The original masterplan of the Bay Campus was designed by Porphyrios Associates working closely with the Princes Foundation for Building Community to ensure that a sustainable and durable campus with high quality public realm was created.

This multi-partner, public/private project is funded through a combination of University, Welsh Government, European Regional Development Fund through Welsh Government, The Department for Business, Innovation & Skills, European Investment Bank and M&G Investments with St Modwen.

There will be several benefits from having the Swansea Technical Staff of ASTUTE 2020 based at the new campus. The facility will have new state-of-the-art facilities and equipment available, which will open up a range of collaboration opportunities for manufacturing companies in West Wales and the Valleys. The geographical location, which is adjacent to junction 42 of the M4, will also be ideal for company representatives travelling to visit the campus.

Cardiff University is currently developing its Maindy Park campus as a major capital element of the institution's Innovation System concept. The current £300m Maindy Park campus development focuses on a 9 acre site in a city centre location, adjacent to the current Cathays Campus. The development of the Maindy Park campus will provide opportunities to co-locate a number of the

University's business-facing and Open Innovation activities, creating an environment where high impact research, research users and co-deliverers can work together. The technical approach and delivery model for ASTUTE 2020 are fully aligned with the ethos of these two major developments.

1.11.6 Two-way Referral System

We anticipate considerable informal interaction between ASTUTE 2020 and the other schemes highlighted above. In addition, we will also set-up a system, which will involve a computer database, for logging referrals from and to these other operations. In this way we will be able to monitor which companies have been cross-referred and monitor how effectively this process is working.

1.12 Potential for Transnational Activity

There will be a small international aspect to ASTUTE 2020. We envisage a small part of the Travel and Transport budget to be used for ASTUTE 2020 staff to visit experts in other countries in order to work with and learn from them and bring the extended knowledge back into WWV. We believe that in order for this knowledge transfer to be effective and of substantial benefit for WWV industry, operation staff will need to travel outside Wales to visit international world-class experts. The ability to travel abroad will also allow us to work with companies headquartered and/or with their RD&I hubs outside the UK, where the resulting innovation in processes or products will feed through to and benefit their manufacturing operations in WWV, thereby directly contributing to the Welsh economy.

Through the WHEB team, ASTUTE 2020 is in discussions with the 'Vanguard initiative for New Growth through Smart Specialisation' and the ERRIN network to identify opportunities for transnational collaboration. We consider it a significant benefit for Wales to exchange best practice with non-Welsh ERDF and other operations in High Value Manufacturing and we would not only be looking for ASTUTE 2020 staff to take part in international meetings but we are also planning to organise one or two workshops where we invite other European Manufacturing operations to Wales to network, learn from each other and build the basis for collaboration e.g. under Horizon 2020 with a view to generate additional economic impact for WWV. The ASTUTE team at Cardiff University's hosting of the inaugural Sustainable Design and Manufacturing conference (SDM-14) in Cardiff during April 2014, at which over 130 academic and industry delegates attended from 21 countries, demonstrated the likely enthusiasm and uptake for such activities.

1.13 Beneficiary and Stakeholder Engagement Plan

Over the past five years, the previous ASTUTE has engaged with its joint beneficiaries and stakeholders via a formal Stakeholder Advisory Board, which has met every 6 months to review progress on the project and advise the Executive Management Committee. We have received very positive feedback from this group, who are supportive of the idea of ASTUTE 2020.

We propose a similar board to oversee the ASTUTE 2020 operation. We have already engaged with several stakeholders directly, as illustrated in Appendix III. A separate Appendix includes Letters of

Support that we have received from manufacturing companies so far and a list of individual joint beneficiaries and stakeholders contacted. As outlined above and in section 6.1.3 further stakeholder engagement will take place during the operation of ASTUTE 2020, e.g. with Industry Wales and EEF enriching the Stakeholder Advisory Board.

1.13.1 Engagement with Joint Beneficiaries

ASTUTE 2020 will be led by Swansea University. It will involve the following additional joint beneficiaries:

- Aberystwyth University
- Cardiff University
- University of Wales Trinity Saint David

All of the above bodies have been successfully working together closely over the past five years in the preparation and delivery of ASTUTE. Interactions have taken place both at the higher level of professorial academic staff and also at the level of project officers and administrators who have attended several joint events and collaborated on projects involving more than one HEI. We therefore have developed a detailed knowledge of our capabilities with respect to manufacturing technologies which has helped to shape the current proposal for ASTUTE 2020. Lead Academics from the above institutions have been engaged in frequent discussions over the last few years on how to shape the operation.

1.13.2 Stakeholder Engagement

We would see the principal stakeholders in ASTUTE 2020 being the following:

- Manufacturing Companies in WWV. These and Industry Wales have helped shape the current proposal via the feedback on the work we have provided during our collaborations with those that lie in the WWV area. Their comments have also helped us develop faster approval procedures which are discussed in the chapter on *Management of Operation*.
- The Welsh European Funding Office and the Welsh Government. We have taken advice from WEFO on the preferred direction for ASTUTE 2020 at a number of meetings over the last 18 months. We are in dialogue with David Rosser, the Welsh Government Fora with an interest in manufacturing, e.g. Industry Wales, and the Advanced Materials and Manufacturing Sector Panel as well as the WG SMART operations to ensure alignment and complementarity.
- The three Regional Bodies highlighted in the Economic Prioritisation Framework as described in the next section.
- Relevant private sector service providers: We are in constant dialogue with The Manufacturer's Organisation, EEF as an umbrella organisation and representation for potential industrial collaborators, the manufacturing sector and for the private engineering design sector, to develop a closer working relationship. They are part of our Stakeholder

Advisory Board and Project Committee.

- We have had constructive discussions with Industry Wales and EEF (Appendix XVI), who have been involved in the development of ASTUTE 2020 and, as a consequence, will actively participate and help in aspects of operation delivery. They have:

  1. Agreed that on the basis of demand review, the three Adaptive Smart Specialisations of
     a. Computational Engineering Modelling,
     b. Advanced Materials Technology, and
     c. Manufacturing Systems Engineering

     are all highly relevant to local manufacturing at the current time.
  2. Agreed to participate in the Horizon Scanning exercises, which will examine any changes in the industrial needs and future opportunities as the project progresses.
  3. Agreed to sit on the Stakeholder Advisory Board for ASTUTE 2020.
  4. Agreed to sit on the Project Committee and participate in the process for selecting and approving individual company projects.

1.14 Engagement with Regional and Thematic Groups

As stated earlier, ASTUTE 2020 is relevant to the economic opportunity of *Advanced Manufacturing* that is described in the Economic Prioritisation Framework (EPF).

In terms of regional and sectoral support, ASTUTE 2020 will be able to support all three regions. Consultation has been undertaken with Swansea Bay City Region, and we have had discussions with the Swansea Bay City Region Board, the North Wales Economic Ambition Board and the Cardiff Capital Region Board who have all accepted the invitation to sit on our Stakeholder Advisory Board.

1.14.1 North Wales Economic Ambition Board

An initial meeting has been held on 27th January 2015 between ASTUTE and [Information Redacted – section 40 (2)] the North Wales Economic Ambition Board. Both parties agreed to work together on an ongoing basis for mutual benefit, and it was felt that there was little danger of duplication of activities by the two organisations.

NWEAB would be prepared for ASTUTE 2020 to use their Directory of Advanced Manufacturing in North Wales as a means to identify suitable companies to collaborate with. This is an excellent document that breaks down companies by size, technology sector and geographical location. NWEAB would also allow ASTUTE 2020 to use data from their Economic Observatory to identify regions of low economic activity if necessary.

ASTUTE 2020 would welcome a representative of NWEAB to attend the Stakeholder Advisory Board. There may be further options for working together in North Wales, such as the co-hosting of meetings by the two organisations and informal referral of companies from one group to another. It was agreed that it would be beneficial to extend this dialogue as appropriate.

1.14.2 Swansea Bay City Region Board

The Swansea Bay City Region Board has previously highlighted ASTUTE 2020 as one of their priority projects for the region. We have met with one of their pillars on the 8th February 2016 to give a presentation about ASTUTE 2020 which was very well received. SBCR are supportive of the operation and it has been agreed to establish close dialogue in the future through the ASTUTE 2020 SAB and sharing of good news stories.

1.14.3 Cardiff Capital Region Board

ASTUTE met with [Information Redacted – section 40 (2)] the Cardiff Capital-Region (CCR) Support Unit on 27th January 2015 and during their discussion identified that there are a number of areas where the proposed ASTUTE 2020 programme and CCR share common industry sector priorities. Shared sector priorities include advanced manufacturing, automotive, aerospace & defence as well as underpinning manufacturing capacity for CCR's priorities in the life sciences and the development of the region's transport & communications infrastructure. Skills development and retention were also identified as priority areas for CCR where ASTUTE 2020 and the associated Materials and Manufacturing Academy doctoral training programme could usefully contribute. The opportunity for ASTUTE 2020 to work with the Ebbw Vale Enterprise Zone was discussed and a follow on meeting involving ASTUTE 2020, CCR and the representative from the Enterprise Zone will be investigated, while a follow on discussion with CCR will be arranged.

1.14.4 Engagement with Thematic Groups

We have had extensive meetings with Industry Wales, the Manufacturer's Organisation EEF and with the Advanced Materials and Manufacturing Panel, during the development of the operation. Industry Wales and EEF have got representation on our Project Committee which will assess project proposals and monitor project progress. These discussions will carry on throughout the lifetime of ASTUTE 2020 individually and through the SAB in order to shape ASTUTE 2020 to Welsh industry needs and to minimise risk of private sector displacement.

1.14.5 Regional Learning Partnership (RLP)

As part of the preparation of the Business Plan, we have been in contact with the Regional Learning Partnership South West & Central Wales. The RLP have reviewed the proposed operation, and [Information Redacted – section 40 (2)], confirmed that ASTUTE 2020 has their support, and that there is strategic fit with the Regional Delivery Plan. A copy of this communication is included in the Appendix.

1.15 Avoidance of Private Sector Displacement

As with any operation designed to support economic activity in a particular region, there is always potential for existing private sector activities to be displaced and it is essential to have robust measures in place to ensure any risks of this happening are minimised. We have had extensive discussions with WEFO and representatives of industry on this issue.

We understand that there are private sector companies who provide services to manufacturing companies and it is important to explain that what is provided by ASTUTE 2020 differs

substantially from these private sector services. ASTUTE 2020 will be focussing on collaborative RD&I with a genuine research challenge that requires University expertise, which could potentially lead to publications at international conferences or in peer reviewed journals.

We have defined the Adaptive Smart Specialisations with this issue in mind. The ASTUTE 2020 partnership will be based on World Leading and Internationally Excellent research capabilities as evidenced in the results of the 2014 Research Excellence Framework.

Routine services such as those provided for example by commercial test houses will be specifically avoided and in such instances we will signpost enquiries to the relevant organisations.

The section on *Management of Operation* will elaborate on the procedures we have put in place to address this issue which will include a robust project approval process involving expert review with relevant industrial representation in view of industrial needs and services that are on offer by the private sector. We will also challenge companies seeking collaboration with ASTUTE 2020 on their efforts of moving the proposed work forward with the private sector.

Key is also full compliance with funding rules and State Aid regulations, which provide a robust legal framework under which operations like ASTUTE 2020 can operate in the same areas as the private sector.

2 Cross Cutting Themes

Over the period 2010 to 2015, the ASTUTE project has given a high priority to the EU Cross Cutting Themes (CCT) of *Equal Opportunities* and *Environmental Sustainability*. An experienced specialist was appointed within Cardiff University to provide expert advice to companies that worked with the partnership of Universities. The original targets specified for "Enterprises adopting or improving Equality Strategies and Monitoring Systems" (20) and "Enterprises adopting or improving Environmental Management Systems" (16) had already been exceeded by 1st February 2015. Furthermore, ASTUTE liaised extensively with the WEFO CCT representatives and we have been encouraged by the level of positive feedback on our approach.

Our initial plan for ASTUTE 2020 was to extend this successful methodology to cover the two CCTs of:

- Equal Opportunities and Gender Mainstreaming
- Sustainable Development

However, we now understand that WEFO wish to centralise support for CCTs for the 2014 to 2020 programme. Swansea and Cardiff Universities have each identified members of operation staff to act as a Champion to promote ownership of the CCTs, supported by academics where appropriate, and, where applicable, encourage activity which supports the equality, sustainable development and tackling poverty requirements and we will review the CCT requirements regularly with WEFO. With regard to the CCT indicators which apply to this operation, we understand that a baseline analysis is being undertaken which will identify the most appropriate method to deliver the CCT indicators for the R, D &I area. It has been agreed with WEFO that delivery of the CCT indicators will be re-considered when the findings of the analysis have been reached.

2.1 Equal Opportunities and Gender Mainstreaming

Swansea University, the lead partner for ASTUTE 2020, has an equality policy[14] that complies with the Equality Act 2010. It has an Equal Opportunities Committee, with three Equality Working Groups that report to it:

- The Disability Equality Working Group (DEWG)
- Gender and Sexuality Equality Working Group (GSEWG)
- Race and Religion Equality Working Group (RREWG)

All four HEI partners within ASTUTE 2020 have *Strategic Equality Plans* in place. These are publically available with the following web links:

Partner	Strategic Equality Plan
Swansea University	http://www.swansea.ac.uk/media/Swansea%20University%20Strategic%20Equa

[14] http://www.swansea.ac.uk/personnel/equal-opportunities/

	lity%20Plan%202012-2016.pdf
Cardiff University	http://www.cardiff.ac.uk/govrn/cocom/equalityanddiversity/stratequalplan/SEP%20%20Strategic%20Equality%20Plan.pdf
Aberystwyth University	https://www.aber.ac.uk/en/media/departmental/humanresources/pdfs/Strategic-Equality-Plan-Final-English-2012.pdf
University of Wales Trinity Saint David	http://www.uwtsd.ac.uk/media/uwtsd-website/content-assets/documents/publication-scheme/3.5-ii.pdf

Furthermore, the universities of Swansea, Cardiff and Aberystwyth have Athena SWAN Institutional awards, and the Cardiff Business School, School of Medicine and Engineering also have departmental awards. The College of Engineering at Swansea is in the process of achieving its Athena SWAN departmental award.

All ASTUTE 2020 partners are committed to Equality in their recruitment processes and the ASTUTE 2020 team includes a number of women in the research teams and in leading roles e.g. the PI for one of the core partners and the Operation Manager are female. Female staff are being encouraged to apply for leading roles as well as their male colleagues. Membership of ASTUTE 2020 management groups is established by role rather than by gender and although gender balance is being considered the required minimum split is not always possible.

All partner HEIs are also committed to the Welsh Language. To comply with Section 61(n) of the Welsh Language Act 1993, they have approved Welsh Language Schemes in place as follows:

Partner	Welsh Language Scheme
Swansea University	http://www.swansea.ac.uk/media/Swansea%20University%20Welsh%20Language%20Scheme.pdf
Cardiff University	http://www.cardiff.ac.uk/govrn/welshlanguageservice/
Aberystwyth University	https://www.aber.ac.uk/en/media/departmental/cwls/pdfs/REVISED-WELSH-LANGUAGE-SCHEME-2014.pdf
University of Wales Trinity Saint David	http://www.uwtsd.ac.uk/media/uwtsd-website/content-assets/documents/strategies-policies/welsh-language-scheme.pdf

Promotional material will be bilingual where appropriate and can be made available in different formats like braille, large print, audio etc. if requested. Tenders for the external evaluations will stipulate the requirement to communicate in Welsh if necessary and executive evaluation summaries will be translated into Welsh. Collaborating companies will be given the option to communicate in Welsh if they prefer.

The ability to speak Welsh is a desirable criterion in all Swansea University's job adverts and we

will encourage the joint beneficiaries to adopt the same approach if they not already do so. Swansea University's Welsh Language Policy stipulates that if a post is identified as needing Welsh in the essential criteria then we go through a bilingual recruitment process. Also throughout employment staff can choose to have documentation through the medium of Welsh, e.g. in the PDR process.

In order to facilitate attendance of disabled people we will ensure that all event venues are accessible and that public transport routes are being considered to promote sustainable transport.

2.2 Sustainable Development

Swansea University, the lead partner for ASTUTE 2020, has a set of basic Sustainability Principles, which state that the University:

- equips students and staff with the knowledge, skills and confidence to create a more sustainable future,
- becomes low carbon, resource efficient, and resilient,
- has attractive, biodiverse campuses that function as green corridors for people and wildlife,
- enables our staff and students to make more sustainable decisions easily, and
- enhances the health and wellbeing of its staff, students, and the wider community.

The sustainability strategies of all the HEI partners within ASTUTE 2020 can be accessed with the following web links:

Partner	Sustainability Strategy
Swansea University	http://www.swansea.ac.uk/media/Sustainability_Our%20Approach%202012-16.pdf
Cardiff University	http://www.cardiff.ac.uk/sustainability/sustainableuniversity/
Aberystwyth University	http://www.aber.ac.uk/en/sustainability/sutainability-policies/
University of Wales Trinity Saint David	http://www.uwtsd.ac.uk/media/uwtsd-website/content-assets/documents/strategies-policies/sustainability-strategy.pdf

In terms of Environmental Management Systems, Swansea University is in its third year of ISO 14001 Certification, and is the first University in Wales to achieve the EcoCampus Platinum award[15]. The EMS allows the University to manage its environmental impacts in areas like resource consumption, waste production, control on emissions, biodiversity, travel, construction & refurbishment and sustainable procurement.

[15] http://www.swansea.ac.uk/sustainability/ems/

Cardiff University operates a single, integrated, safety, health and environmental management system[16] which conforms to both ISO 14001 and BS OHSAS 18001 Management Standards.

Aberystwyth University decided in 2012 to put in place an Environmental Management System[17] across the university via the BS 8555 'Phased Implementation of Environmental Management Systems'. The ultimate aim is to achieve accreditation to a standard such as ISO 14001.

University of Wales Trinity Saint David has an Environmental Management System[18] and the University's Carbon Management Plan[19] was adopted by the University Council at its meeting in July 2014.

To comply with the 'Well Being of Future Generations Act (2015)' we will aim to integrate new and improved systems to help in the sustainable process and encourage the ASTUTE 2020 team to implement sustainable practices within their work. We will promote awareness of the Health and Wellbeing services within the partner HEIs.

ASTUTE 2020 will encourage sustainable travel for all staff and consider Skype and video conferences as an alternative wherever appropriate.

In ASTUTE 2020 Swansea, a dedicated display area for information about sustainability and relevant 'eco' actions (comparable to an eco-code poster) has been set up. Relevant information will be sent to all ASTUTE 2020 staff about waste, energy, travel, wellbeing and community to encourage the whole team to get involved. This activity will be led by a dedicated person in the Lead Beneficiary's Coordination and Support Team continuing on from the bronze, gold and platinum awards achieved from 2012 – 2015 through the Green Impact scheme. We will join any initiative that Swansea University will be running and encourage our partners to do the same.

Local and sustainable supply chain practices are an integral part of all procurement departments in the partner HEIs. Procurement from local suppliers will be encouraged by using Sell2Wales where appropriate.

2.3 Tackling Poverty and Social Inclusion

ASTUTE 2020's focus will be on providing RD&I support for WWV enterprises. It is expected that this support will promote economic growth and create sustainable jobs in these enterprises. These jobs will be equally relevant to people who are new to the labour market as well as those who are returning. We acknowledge the links between SMEs not being able to conduct RD&I and the wider impacts of tackling poverty and social exclusion. Limited finances on the part of SMEs should not be a barrier to engaging with ASTUTE 2020, as we are not setting out to charge companies for working with the Operation. Our main activity are RD&I collaborations where the companies will

[16] http://www.cardiff.ac.uk/osheu/toolkit/SHEstandards.html
[17] https://www.aber.ac.uk/en/hse/policy/environmental/
[18] http://www.uwtsd.ac.uk/inspire/inspire-activity/living-within-our-environmental-limits/
[19] http://www.uwtsd.ac.uk/media/uwtsd-website/content-assets/documents/strategies-policies/carbon-management-policy.pdf

have to provide input in form of staff time, materials etc. If the risk for SMEs in deprived areas to engage in such collaboration would be too high, we can consider an initial feasibility study under block exemption without company contribution to evaluate the feasibility of a collaborative project. We envisage a number of half day 'Technology Awareness' events and we can look into holding some of them in deprived areas identified by the WMD (e.g. Merthyr Tydfil, Blaenau Gwent, Neath Port Talbot etc.).

ASTUTE 2020 will in general contribute to tackling poverty by creating and safeguarding jobs. We found in ASTUTE that the jobs created spanned a range of salaries. Our work will therefore help generate income into the areas surrounding the enterprises we deal with. Manufacturing, by its very nature, causes a net inflow of income to the local area in which it is located and into the areas of associated supply chain operations. This will support the areas 'Helping people into work' and 'Preventing poverty' from the WG's 'Tackling Poverty' Action Plan. ASTUTE 2020 will work closely with ESF operations like the Materials and Manufacturing Academy, M2ETAL and the Foundation degree operation that help people improve their skills and qualifications in order maximise the economic benefit from the ESI investment. We are also considering developing links with STEM CYMRU 2 to look into the potential of developing additional avenues to promote engineering to those still in education.

We will update WEFO/CCT in the review meetings with numbers for the 'Additional jobs created in supported enterprises'. The indicator 'Increased spend by the companies in the local supply chain', on the other hand, will be part of the external evaluation as stated in the BP. We will therefore not be able to provide quarterly updates but will have to rely on the external mid-term and final evaluation.

3 Suitability of Investment

High Value Manufacturing will be the target sector of the ASTUTE 2020 Operation. To demonstrate its importance to the economy of WWV, we will look first at the relevance of manufacturing to the UK economy in general and then at its position within Wales.

We then discuss the barriers and challenges faced by this sector, and how ASTUTE 2020 will overcome these. Further demand evidence is then presented. Lastly, we will explain the steps we will take to avoid private sector displacement.

3.1 The Target Sector – High Value Manufacturing

3.1.1 Manufacturing in the UK

In October 2013, the UK government published the results of a 2-year Foresight project that looked at the Future of Manufacturing[20]. This report involved 300 leading business people, experts and policy makers. It recognised the importance of manufacturing to the UK economy which was demonstrated by several quantitative measures:

- Manufacturing contributed £139 billion to the UK Gross Domestic Product in 2012.
- Manufacturing companies are more likely to engage in Research and Development. For Example, 41% of manufacturing businesses with 10 or more employees allocated resources to R&D in 2010 compared with an average of 23% of businesses in other sectors.
- Manufacturers are more likely to innovate. In 2010, 26% of manufacturing businesses with 10 or more employees carried out process innovation compared with less than 14% for non-manufacturers, and 44% undertook product innovation (less than 26% for non-manufacturers).
- The growth in total factor productivity for manufacturing has been 2.3% per year between 1980 and 2009, compared with 0.7% per year for the UK as a whole.
- Manufacturing businesses are more likely to engage in exporting. In 2010, 60% of manufacturing businesses with 10 or more employees exported products and services compared with 26% of non-manufacturers. UK exports of goods produced by the manufacturing sector totalled £256 billion in 2012.
- In 2011, remuneration in UK manufacturing was 10% higher in comparable occupations compared with the average across all industries.

In addition, the report highlighted the fact that manufacturing affects other sectors through its wide range of input-output and other linkages, and also drew attention to the fact that economies with strong, export-led manufacturing sectors typically recover from recessions faster than those without equivalent manufacturing sectors.

Comparison of the performance of manufacturing in the UK relative to some of its international

[20] Future of manufacturing: a new era of opportunity and challenge for the UK. Government Office for Science and Department for Business, Innovation & Skills, 30 October 2013. https://www.gov.uk/government/publications/future-of-manufacturing/future-of-manufacturing-a-new-era-of-opportunity-and-challenge-for-the-uk-summary-report

competitors revealed a number of weaknesses and strengths. Weaknesses included:

- Expenditure on manufacturing R&D has been low, especially with regard to new products,
- Investment in capital equipment has been relatively low for many decades,
- The UK's share of global manufacturing exports has fallen from 7.2% in 1980 to 2.9% in 2012.

Notable strengths included:

- When total factor productivity is compared between the UK, the Netherlands, Spain, France, Italy and Germany, from 1980 and 2009, manufacturing performs best in the UK.
- The fall in the UK's share of goods exports has been accompanied by an increase in export intensity (manufacturing exports as a proportion of manufacturing output), which rose from about 30% in 1991 to around 47% in 2011; which is similar to France and higher than the US.

It was also highlighted that manufacturing is undergoing a profound change, creating major new sources of revenue and value beyond the production and sale of products. Physical production can be seen at the centre of a wider manufacturing value chain shown in Figure 3.1.

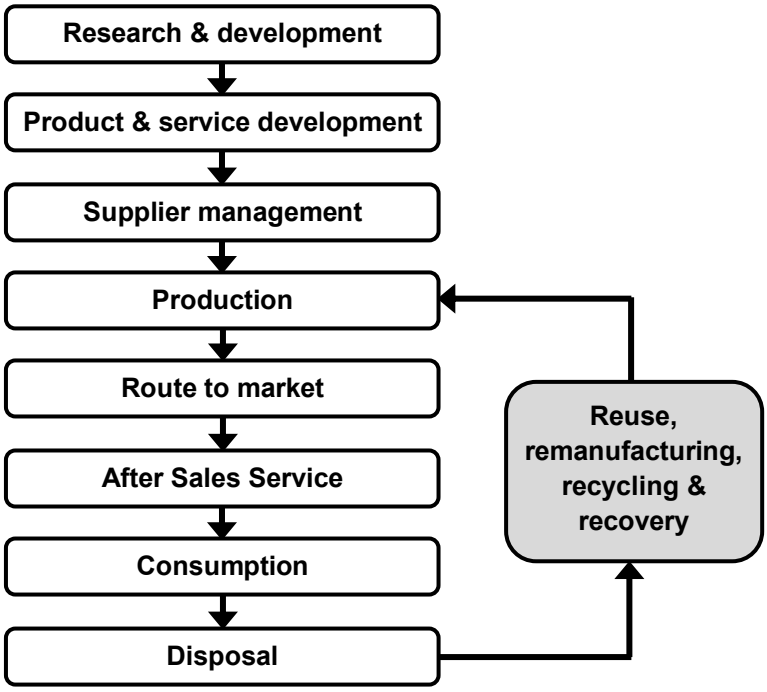

Figure 3.1 Value Chain for manufacturing described by the *Future of Manufacturing* report.

In addition, Innovate UK (formerly the Technology Strategy Board) has produced a High Value

Manufacturing Strategy for 2012-2015[21]. This confirms that manufacturing:

- generates 10% of UK GVA,
- employs 2.5 million people in the UK
- generates half of UK exports
- accounts for three quarters of business R&D conducted in the UK

Innovate UK defines 'High Value Manufacturing" as follows:

> *"High Value manufacturing is the application of leading-edge technical knowledge and expertise to the creation of products, production processes, and associated services which have strong potential to bring sustainable growth and high economic value to the UK. Activities may stretch from R&D at one end to recycling at the other",*

The strategy document then emphasises the importance of this subset of manufacturing:

> *"Manufacturing in general represents an important strategic competence within the UK economy, but it is high value manufacturing specifically where we see the most opportunities for innovative businesses to succeed long-term."*

This point was reinforced by the statistic that High Value Manufacturing contributed £151bn to the UK balance of payments in 2010 (35% of all UK exports).

3.1.2 Manufacturing in Wales

Having established the importance of manufacturing to the UK as a whole, we turn now to look at the position of this sector within Wales. There is significant evidence that manufacturing plays an even greater role in the Welsh Economy than in the rest of the UK. For example, the Economic Prioritisation Framework[22] states that:

> *Manufacturing is a larger proportion of the Welsh economy than the UK as a whole and has been undergoing a transition from low skilled high volume, to more advanced manufacturing capability built on high skills in emerging clusters and areas of expertise. Advanced manufacturing is closely linked to research and innovation strengths and attracts a large amount of research and innovation funding, particular the development and production of advanced materials for a range of industries. Manufacturing is further characterised by high salaries and high levels of exports, and Wales has several blue chip large employers in this sector.*

This is confirmed by a study by PricewaterhouseCoopers[23], which looked at regional variations in

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[21] High Value Manufacturing Strategy for 2012-2015, Technology Strategy Board, October 2014 https://www.gov.uk/government/publications/high-value-manufacturing-strategy-2012-to-2015

[22] The Economic Prioritisation Framework for Welsh European Funds: A Guidance Document providing an Investment Context for the Implementation of EU Programmes in Wales, Version 2: March 2014

[23] UK Economic Outlook November 2014: Getting the balance right in the UK regions. http://www.pwc.co.uk/the-conomy/publications/uk-economic-outlook/ukeo-nov2014-getting-the-balance-right-in-the-uk-regions.jhtml

the UK economy. It found that manufacturing's share of GVA in 2011 varied from a high of 17% in Wales to just 3% in London.

A more recent picture of manufacturing in Wales can be provided by the Welsh Government's *StatsWales* service[24]. Table 3.1 presents the data for Production Industries (SIC2007 divisions). As of 2014, 159,900 people were employed in 14,670 enterprises in Wales with a combined annual turnover of £58.4 billion. The corresponding figures for WWV were 89,100 people employed in 8,765 enterprises with a turnover of £ 36.2 billion, demonstrating the critical importance of manufacturing to the WWV area.

Table 3.1 Data for Production Industries in Wales in 2014 compared to figure for UK

	Employment	Enterprise Count	Turnover (£ million)
WWV	89,100	8,765	36,206
East Wales	70,800	5,995	22,221
Wales Total	159,900	14,670	58,427
UK	2,982,100	331,805	788,918

Indeed, it can be seen from Table 3.1 that production industries have a larger contribution to WWV than to East Wales. This is demonstrated in terms of employment, number of enterprises and combined turnover.

Using the *StatsWales* facility it is also possible to break these figures down according to the size band of enterprises, and the data for this is presented in Table 3.2.

Table 3.2 Production Industries in WWV by size (2014)

	Employment	Enterprise Count	Turnover (£ million)
Micro (0-9)	13,500	7,740	894
Small (10-49)	12,800	625	1,209
Medium (50-249)	21,600	255	3,452
Large (250+)	41,200	150	30,649
Total	**89,100**	**8,765**	**36,206**

[24] https://statswales.wales.gov.uk/Catalogue/Business-Economy-and-Labour-Market/Businesses/Business-Structure/Headline-Data/Enterprises-by-Industry-SIC2007-SizeBand-Area

It can be seen that there is significant employment across all size bands of enterprise.

StatsWales does not break this information down in to sub-sectors, but from our experience of working in ASTUTE over the period 2010 to 2015 we know manufacturing sub-sectors include companies in the following areas:

- Aerospace and Defence
- Automotive
- Oil and Gas
- Medical Devices and Instruments
- White goods
- Electronics
- Metals processing
- Production of Advanced Materials
- Other High Value Manufacturing

It should be emphasised here that ASTUTE 2020 will be targeting High-Value Manufacturing. However we do not at this stage specify which sub-sectors of manufacturing we consider as "high-value". This is because it is more appropriate to consider each company on a case-by-case basis in terms of the potential to innovate, grow and increase its contribution to the economy of the region. We have a set of procedures to assess potential projects with companies which are described under the section on "*Management of Operation*".

In addition, what we have learned about manufacturing industry in WWV is that it is the sector that faces some of the greatest challenges from: (i) competing manufacturers across the globe, (ii) increasing environmental constraints, (iii) pressures on materials and energy resources, and (iv) innovative manufacturing global technological trends. There is also a shortage of skills in companies to undertake RD&I to address these problems.

In light of the changes in manufacturing, the ASTUTE project commissioned a study by GWOS Consultants Ltd. in 2014 with regards to Global Megatrends in manufacturing, their relevance to the Welsh manufacturing industry and how to support the local manufacturing industry to exploit these[25]. The report highlighted the importance of horizon scanning and future proofing new technologies to enable the Welsh industrial base and in particular Welsh SMEs, to be agile and flexible in responding to global disruptive megatrends. ASTUTE 2020 will aim to increase the economic impact made by its predecessor through demand-led collaboration with manufacturing companies in a range of technology areas relevant to advanced, high-value, sustainable manufacturing, but also by providing innovation and manufacturing demonstration and development facilities to future proof and de-risk technology development for industry. Horizon scanning will not only inform about new technologies and possible megatrends but also Adaptive

[25] ASTUTE Welsh Manufacturing Futures to 2050 - A Strategic Analysis. Report of work undertaken 2014, GWOS Consulting Ltd.

Smart Specialisation for targeted, early developer/adopter funding streams.

3.2 Barriers Faced

The High Value Manufacturing sector can provide significant opportunities for growth within WWV. However, this can only be achieved via successful innovation in companies based in this region. It is here that significant barriers exist – increasingly innovation requires access to a diverse range of technical expertise across several scientific disciplines. Frequently SMEs (and some larger companies) do not have the correct mix of technical expertise within their organisations locally or globally, since this would be prohibitively expensive. Thus they lack the critical mass to effectively innovate without there being a high perceived risk. Furthermore, the senior managers of SMEs often do not always have sufficient time to engage in strategic activities such as monitoring global trends in their sector that could provide opportunities for innovation.

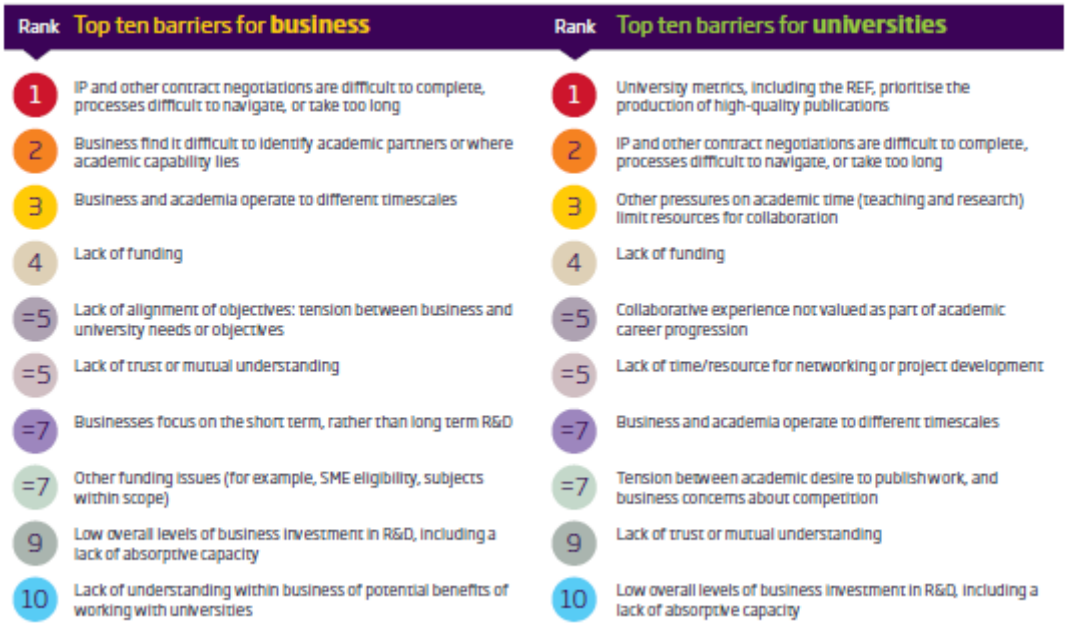
We can divide this problem into a number of generic barriers for High Value Manufacturing as follows:

- Companies often require de-risking of innovative technology developments.
- RD&I in industry can be restricted by limited access to facilities and expertise.
- Knowledge created through RD&I projects is difficult to embed without the right knowledge transfer.
- RD&I are not the main operational activities of many companies.
- Companies might not be fully aware of megatrends, and do not have time for establishing an innovation culture.
- Companies often find it difficult to demonstrate the proof of concept for their idea to a potential investor.
- Companies are uncertain how to exploit intellectual property for commercial advantage.
- Universities have the expertise, but lack dedicated resources at the scale required to constructively engage with companies in collaborative projects. Furthermore, conventional routes to supporting University-Industry collaboration tend to be slow and unresponsive when industry often needs fast, highly reactive access to University research informed expertise.

These apply across almost all of the sub-sectors of High Value Manufacturing.

Another view of barriers for successful university – industry collaborations is given in the Dowling Review: [26]

[26] The Dowling Review of Business-University Research Collaborations, BIS, July 2015.



In addition to these *generic barriers*, we have also identified a number of *specific needs* associated with enabling innovation in High Value Manufacturing companies, and these were mentioned in the chapter on '*Strategic Fit':*

a) The need to reduce costly "trial and error" approaches in improving manufacturing processes and manufactured products and to improve understanding of complex processes and products.
b) The need to introduce new materials into products, to adopt more innovative techniques for processing other advanced materials and to better understand their performance and behaviour.
c) The need to develop processes or systems to enable sustainable products, services and supporting supply chains throughout the whole life cycle and to exploit digital processes and connectivity in the manufacturing process.

3.3 Overcoming the Barriers

The barriers described in the previous section represent significant examples of failure in general and of market failure. Without intervention, opportunities for innovation and growth within high value manufacturing companies in WWV will be missed, and prospects for improving the economy of the region will be lost.

ASTUTE 2020 will overcome these barriers through a partnership of Welsh Universities which will address the generic barriers as described in Table 3.3.

Table 3.3 Generic barriers faced by manufacturing industry and the solutions offered by ASTUTE 2020

Generic Barrier	Solution
Companies often require de-risking of innovative technology developments.	The ability to work closely with world-class academic experts and dedicated full time project officers will contribute to RD&I capabilities in industry and offer additional capacity in the companies to develop essential technologies or de-risk innovative technologies.
RD&I in industry can be restricted by limited access to facilities and expertise.	The world-class expertise and facilities available in the ASTUTE 2020 partnership will provide access to experts in different engineering and science disciplines and state-of-the-art equipment.
Knowledge created through RD&I projects is difficult to embed without the right knowledge transfer.	Close alignment of research and skills development will provide effective knowledge transfer.
RD&I are not the main operational activities of many companies.	Knowledge exchange with academic experts will stimulate and support the development of innovation in collaborating companies.
Companies might not be fully aware of megatrends, and do not have time for establishing an innovation culture.	ASTUTE 2020 will carry out horizon scanning exercises, the results of which will be fed back to the companies.
Companies often find it difficult to demonstrate the proof of concept for their idea to a potential investor.	The ASTUTE 2020 HEI partners will work in collaboration with companies to support development of suitable proofs of concept and/or demonstrate problem solutions for the manufacturing industry.
Companies are uncertain how to exploit intellectual property for commercial advantage.	ASTUTE 2020 will look into mechanisms for exploitation of IP and IPR coming out of the operation to strengthen the Welsh scientific and technological base, boost innovation and ensure economic growth. The project will seek to signpost to existing mechanisms within the HE and Welsh Government sectors and to add value to them.
Universities have the expertise, but lack dedicated resources at the scale required to constructively engage with companies in collaborative projects. Furthermore, conventional routes to supporting University-Industry collaboration tend to be slow and unresponsive when industry often needs fast, highly reactive access to University research informed expertise.	ASTUTE 2020 will provide the essential human resource to deliver fast and responsive demand-led, collaborative, applied research, not possible otherwise. The operation will build on the strongest aspects of the current partnership of Welsh academic experts to provide easy to use, world class support in advanced, high value manufacturing.

ASTUTE 2020 will also address the specific needs described in the previous section through our

Adaptive Smart Specialisations, as described in the chapter on *Strategic Fit*.

The ultimate benefit of this approach will be felt by High Value Manufacturing companies in WWV.

3.4 Stakeholder Consultation and Engagement

We have engaged with a range of stakeholders, including the following, as mentioned in the chapter on *Strategic Fit*:

- North Wales Economic Ambition Board
- Swansea Bay City Region Board
- Cardiff Capital Region Board
- Regional Learning Partnership

We have also received positive feedback from a variety of other stakeholders as demonstrated by the following quotes:

> "Swansea University's ASTUTE project was raised as **being effective** and **the only true business support mechanism** aimed at helping **Welsh Manufacturing** companies. ….. **no other WG funded** support mechanisms were outlined as being **particularly successful** …. a number of companies highlighted that ASTUTE was seen as the programme of assistance that was being used in the main to deliver the larger scale projects in companies." [Manufacturing Supply Chain Development Study (The Centre for Supply Chain Operations and Procurement Excellence), 2014]

> "Programmes such as the **ASTUTE Project**, currently funded from Structural funds, need to be scaled up using Horizon 2020 funds. The Astute project allows Welsh businesses to access the latest innovations in advanced manufacturing from eight Welsh Universities to generate solutions to a wide range of manufacturing problems. **This project needs to be extended and used as a flagship programme for EU Research and Innovation spending**." [Kay Swinburne, MEP, 2014]

> "**Continuing** support for **excellent** pan-Wales R&D **collaboration** schemes such as **ASTUTE**, where universities in Wales provide state aid funded **R&D services** to Welsh-based enterprises **is important**. It not only makes enterprise aware of what can be achieved with R&D but also makes the universities more commercially focused." [An economic strategy for Wales? IWA – Institute of Welsh Affairs, March 2015)]

Naturally one the most significant groups of stakeholders are the manufacturing companies in WWV. These have been engaged with both via the Final Evaluation of ASTUTE and also directly via ASTUTE staff.

Further demand evidence for ASTUTE 2020 is thus provided by the results of the Final Evaluation

of the ASTUTE project[27]. The section of the report dealing with *Market Need* describes the outcomes of interviews with 86 companies who had collaborated with ASTUTE. Of these, 70 companies (81 % of those interviewed) expressed a need to work with ASTUTE on a new or an additional project.

During preparation for ASTUTE 2020, we approached a range of companies in WWV for letters of support for the proposed operation. The full 77 letters of support from companies in the separate Appendix show not only a significant demand by industry for this type of collaboration, but also demonstrating that hurdles of trust and lack of understanding have been successfully overcome by ASTUTE.

Where these companies have worked with ASTUTE previously, many of these have emphasised the fact that they could not have gained this type of support from any other sources. This together with our engagement with Industry Wales and EEF as relevant private sector representatives gives us confidence that the proposed activities of ASTUTE 2020 have minimal risk of duplicating by existing or planned public or third sector support.

As already outlined above in Sections 1.13 and 1.14, further extensive stakeholder engagement has taken place with positive responses to the proposed ASTUTE 2020 operation. Our discussions with Industry Wales have been particularly useful in this respect and a letter of support from them is included in Appendix XVI. They have worked with ASTUTE 2020 on the development of the three Adaptive Smart Specialisations of Computational Engineering Modelling, Advanced Materials Technology, and Manufacturing Systems Engineering, ensuring these are highly relevant to local manufacturing at the current time.

3.5 Avoidance of Private Sector Displacement

To avoid any duplication of services provided by the private sector, ASTUTE 2020 will focus on utilising the world-class research and expertise facilities associated with the partnership of Universities in Wales. We will be concentrating on a small number of Adaptive Smart Specialisations, which build upon recognised expertise as defined in the 2014 Research Excellence Framework.

Furthermore, ASTUTE 2020 has taken the following steps to prevent displacement of private sector providers:

- Relevant Industrial sectors like the engineering design and innovation service providers are represented on the Stakeholder Advisory Board in form of Industry Wales and EEF.
- We will ensure our marketing materials accurately reflect the emphasis on collaborative RD&I and knowledge exchange.
- We will assess all enquiries from companies in a three stage process and reject those that are not fully aligned with the ASTUTE 2020 operation, signposting them to WG operations or

[27] Final Evaluation Report for the ASTUTE (Advanced Sustainable Manufacturing Technologies) Project, Ciotek Ltd., 2015

to the Private Sector. ASTUTE 2020 will not signpost to specific providers, but rather to a sector. We would welcome organisations such as Industry Wales and EEF to support us in directing to the correct solution providers.

- We have procedures in place to consider private sector displacement when project proposals are assessed by our Project Committee that includes relevant industrial sector representation (Industry Wales and EEF) to ensure that any concerns about the implementation of projects can be raised at an early stage, and involves challenging companies seeking ASTUTE 2020 collaborative support on their knowledge of relevant private sector provision and their efforts in engaging with these.
- We will keep a log of all proposal rejections/referrals and of subsequent involvement of the private sector in any product launches that take place as result of an ASTUTE 2020 collaboration.
- The risk of private sector displacement and measures for mitigation will be an integral part of our independent external evaluation.

We have also registered the ASTUTE 2020 operation under the GBER scheme and will conduct most our collaborative R&D projects under the EU R,D & I framework. We are mindful of private sector displacement at every stage of project selection and approval, and are involving external industrial advice via Industry Wales and EEF, who are sitting on the Project Committee and who will contribute to the Stakeholder Advisory Board advising ASTUTE 2020 on industry's view of the projects carried out. Relevant industry representatives will thus be able to comment on individual projects, the implementation of the operation and also in a more strategic manner on the overall process.

The project selection procedure, which is discussed in more depth in the chapter on '*Management of Operation'*, will be a robust three stage process that filters out unsuitable projects at an early stage. It will ensure that all projects approved have a clear research challenge defined that aligns with one or more of our Adaptive Smart Specialisations.

4 Delivery

4.1 Introduction

The ultimate change sought through the proposed operation is *Transformational Growth and Sustainable Prosperity* for WWV. The output from the operation that will deliver this change is *innovation*. To drive forward this innovation the key activity of ASTUTE 2020 will be *Collaborative RD&I* between Companies and partner Universities using Adaptive Smart Specialisation in Manufacturing Technologies over the period 2015 to 2020.

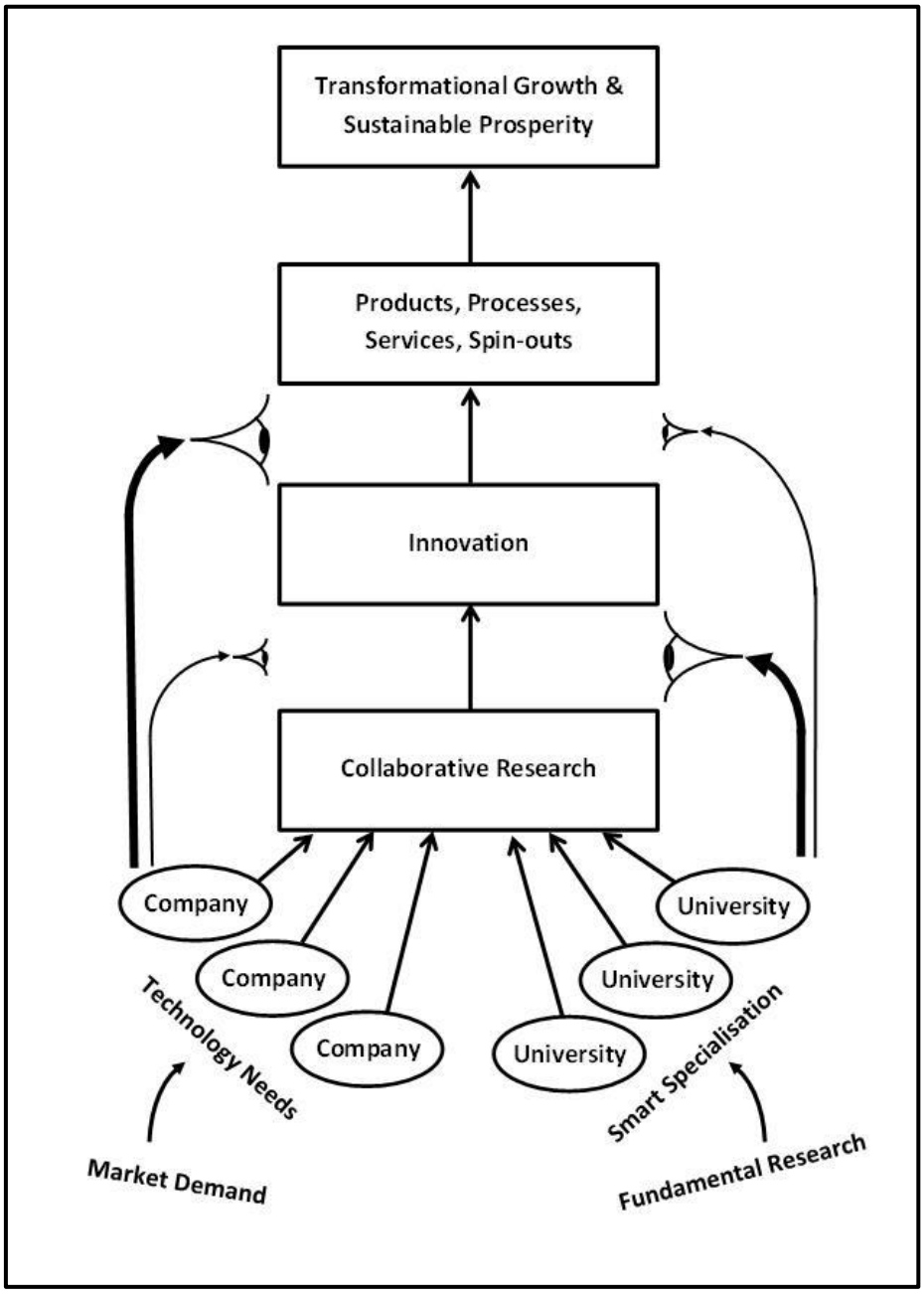


Figure 4.1 Illustration of how collaboration between Companies and Universities can lead to Growth and Prosperity

This can be explained with reference to Figure 4.1. The principal delivery mechanism will be

research carried out collaboratively between Companies and the Universities that make up the ASTUTE 2020 Partnership. The Adaptive Smart Specialisations of the Universities will be matched to the technology needs of the Companies..

These collaborations will enable bilateral transfer of technology between the HEIs and companies based in WWV. The collaborating companies will then be able to innovate more effectively, adopting more advanced and sustainable technologies.

This innovation process is successful when these WWV businesses can launch new or improved commercial products, processes and services. These will in turn result in increased sales (e.g. for new products) and/or reduced costs (e.g. reduced energy use in the new processes). The turnover and profitability of businesses will thus increase and, as many manufacturers have local supply chains, additional businesses in WWV will benefit through a multiplier effect.

Companies will thus grow, providing increased employment and supply chain spend in the local area (e.g. contractor companies that service manufacturing equipment, providers of raw materials, providers of professional services etc.). Where the manufacturing companies and their supply chains are locally owned there will also be increased profit that is distributed into the local area. All these factors should therefore have a strong, positive and long-term impact on economic prosperity.

We would like to emphasise two critical links in this process (which are associated with the "eyes" in Figure 4.1):

(i) between research, development and innovation, and

(ii) between innovation and market deployment of new products/processes and services.

Often companies are in the best place to see the link between innovation and market deployment. They generally have detailed knowledge of the markets that their products and services are sold to. However, it is often the case that Universities can have a better view of the link between research, development and innovation. Companies may not have the correct mix of scientific expertise to fully appreciate the possibilities that could arise from applied research involving the wider skill sets associated with the Adaptive Smart Specialisations of the Universities. Without the specialised outside view of the Universities it is inevitable that opportunities for innovation will be lost.

Thus the collaborative link between Companies and Universities is essential to maximise innovation. It is not just the collaborative research between Universities and Companies that produces results, but also the identification of opportunities for the Company by the Universities. This theme of identifying opportunities will play an increasing role in ASTUTE 2020.

A new area for ASTUTE 2020 will be an activity aimed at facilitating the identification of international links as specified in the Targeting Principles of ERDF Specific Objective 1.2. This activity will aim to actively interact with EU wide initiatives, which will include, for instance:

- Visits to WHEB (Welsh Higher Education Brussels) which promotes the interests of the Welsh Higher Education sector in Europe and provides intelligence to Welsh Universities on EU development and funding opportunities.

- Visits to Europe with a view to participating in the Vanguard Initiative for New Growth through Smart Specialisation and the ERRIN network.
- A limited number of international conferences, each of which will be attended by a single representative from ASTUTE 2020. The aim will be to present results of Collaborative Projects that have taken place between ASTUTE 2020 and companies in WWV. The choice of conference will be determined by the exact nature of the projects, so it is not possible to identify the individual conferences at this stage.
- A limited number of visits to companies headquartered and/or with their RD&I hubs outside the UK, where the resulting innovation in processes or products will feed through to and benefit their manufacturing operations in WWV, thereby directly contributing to the Welsh economy.

It is anticipated that costs for the first two of these will be around £3,600 (from the Co-ordination and Support Team budget). For the conferences and company visits we anticipate around £23,000 from the technical delivery budgets (mainly Swansea and Cardiff). The appropriate WEFO guidance on travel expenses will be followed when arranging travel and claiming expenses. For all non-UK visits we will seek approval from WEFO for each individual case before making any arrangements.

We will bring the benefit of these activities to WWV to increase the impact of ASTUTE 2020 in the WWV economy via access to other networks and transfer of knowledge. *Collaboration* between Universities and Companies in WWV is the underpinning principle of the activities described above and is thus the preferred option for delivery of the ASTUTE 2020 operation.

One additional essential aspect is the inclusion of Adaptive Smart Specialisation. Due to the fast technological development, some new manufacturing processes and related technologies might arise during the course of ASTUTE 2020. Rather than missing out on these opportunities or to address these potential threats for companies, it is anticipated to run two horizon scanning exercises where a group of outside experts, industrial representatives and key academics from the ASTUTE 2020 partnership will engage in forward looking discussions. The result of the work of this expert group will guide the ASTUTE 2020 partnership with respect to Adaptive Smart Specialisations of high relevance and high potential impact for the Welsh economy. This enables the ASTUTE 2020 partnership to systematically respond to relevant trends thereby increasing the potential impact it can achieve when compared with fixed smart specialisation topics.

One of the two horizon scanning exercises will be held to feed into the mid-point review of ASTUTE 2020, the other near the end (exact timing to be determined from feedback on the first one). To both of these we will invite Industry Wales, the EEF, Welsh Government representatives, External Consultants and representatives of other industrial representations as determined by the Executive Management Committee in consultation with the SAB to work with the ASTUTE 2020 team. Both these events will be held at a location within West Wales and the Valleys. The costs for the two Horizon Scanning Workshops are presented in Section 7.8.1. under “External Services and Experts”.

The R&D Collaborations will focus on one or more of the following Adaptive Smart

Specialisations:

- Computational Engineering Modelling
- Advanced Materials Technology
- Manufacturing Systems Engineering

These have been determined from an analysis of demand and result from the ASTUTE project over the period 2010 to 2015, and Appendix XVII elaborates on the relative resources that we anticipate will be devoted to each specialisation.

4.1.1 Key Factors for Successful Collaborations

Collaboration between Universities and Business has been the subject of a recently completed review on behalf of the UK Government[28]. This in-depth analysis found that the top ten key factors for a successful collaboration were as follows (in order of importance):

Many of these principles were independently developed and followed during the ASTUTE project over the period 2010 to 2015 and we can now use this framework moving forward for ASTUTE 2020.

4.2 How will ASTUTE 2020 be different from ASTUTE?

The ASTUTE project has been running since 2010 and the lessons learnt from the activities over the last five years form a vital input to the shaping of the proposal for ASTUTE 2020. Focussing on three areas of Adaptive Smart Specialisation, ASTUTE 2020 will have a more concentrated

[28] The Dowling Review of Business-University Research Collaborations, July 2015, http://www.raeng.org.uk/publications/reports/the-dowling-review-of-business-university-research

approach than its predecessor. ASTUTE 2020 is looking for more long term collaborations and their selection will involve industrial input. Over the course of the ASTUTE project we have monitored the industrial demand for the 15 technology areas originally identified as those where industry needs would be significant, assessed the level of HEI excellence and also considered which of these have led to the most successful results in terms of economic impact in WWV. Details of this assessment, which has led to the three areas, are described in the chapter on '*Strategic Fit'*. We have also conducted a SWOT analysis based on discussions between partners and feedback from stakeholders, the details of which are presented as Appendix VI. Based on this analysis, we outline below the key aspects of ASTUTE to be retained in ASTUTE 2020, and indicate what changes will be made. References are made to the individual SWOT items that are being addressed.

Clearly, there are many advantageous points that have arisen from the ASTUTE project over the period 2010 to 2015 and we will retain these aspects to ensure that ASTUTE 2020 is built on solid foundations with tried and tested practices:

- ASTUTE 2020 will harness the world-class expertise from a partnership of Welsh Universities (S1).
- Collaborative RD&I will be at the heart of ASTUTE 2020, acting as our primary instrument for delivering the innovation that will lead to transformational growth and sustainable prosperity (S2, S3, S4, S5).
- The Governance structure will largely be retained (S7) but it will be enhanced with a clear focus on achieving specified deliverables and a robust project approval process (S2).
- ASTUTE 2020 will continue the positive interactions between its partner HEIs and will seek to enhance this by means of strategically focussed Smart Specialisation driven projects where possible (S8).
- ASTUTE 2020 has started 1 July 2015 to ensure continuity (T2).

The SWOT analysis has been very helpful in that it has identified several ways in which we will make improvements in ASTUTE 2020. The main areas are outlined below:

- The first main difference for ASTUTE 2020 will be that there will be a clear focus now on Adaptive Smart Specialisation (O1, O2, W5). We will concentrate on three Adaptive Smart Specialisations based on industry demand mapped onto areas of research excellence and all collaborative projects will be required to demonstrate alignment to these areas.
- An Adaptive Smart Specialisation approach guided by a panel of external experts, industrialists and academics has implications for the way the partnership will be run and how the funds are allocated, which will be described later.
- There will also be a focus on emerging technology sectors, using horizon scanning (O3) which will help us identify further innovation opportunities for companies.
- We will look at more flexible mechanisms of working with companies from a State Aid perspective, as described in the chapter on '*Financial and Compliance*' – keeping as many

options open as possible (W2) with flexibility of IP arrangements (W3). Compliance with State Aid regulations will be assessed on a project by project basis at the project proposal stage before the start of a project and documented appropriately, referring directly to the regulations and applying the requirements of the relevant article at all times.

- We will have links with other UK institutes, such as the High Speed Sustainable Manufacturing Institute or the HVM catapults (O6). We will also aim to identify International Links (O7).

- We will aim to maximise the awareness of ASTUTE 2020 and optimise our interactions with other relevant bodies and initiatives that are in a position to refer appropriate businesses on to ASTUTE 2020. (W4).

- We will consider options for providing a sustainable long term mechanism for enabling continued access for manufacturing firms to specialist academic support and to establish a legacy for the Universities following the conclusion of ASTUTE 2020 (O5).

- Whilst the governance structure will remain similar, we will address the initial company interaction process with the aim of improving the responsiveness and efficiency of our operations through introducing electronic procedures (W1, O8) and early "decisions in principle" on potential projects (W2), with a newly formed Project Committee to provide expert review.

- The project approval process will be strengthened to ensure highly relevant projects, with high impact potential are approved and also to avoid the risk of private sector overlap (T1) and to deal more efficiently with embryonic companies (W7). External industrial advice from the relevant sectors will be part of the project approval process.

4.3 Consideration of Delivery Options

At this stage it is appropriate to consider some options regarding how the aims of ASTUTE 2020 could be delivered. There are a number of questions that could be considered. For example, should the proposed funding package be given directly to Companies or Universities? How should the funds be distributed on a geographical basis? How should the funds be distributed between institutions? We will look at these in detail below.

4.3.1 The "Do Nothing Option"

The first thing to consider would be what would happen if no funding were provided for ASTUTE 2020. In this scenario, a key mechanism enabling fruitful interaction between manufacturing firms and academic expertise would cease with the result that significant opportunities for innovation in Welsh manufacturing companies would be lost. Successful projects between manufacturing companies and Universities, such as the collaborative ones run under ASTUTE over the period 2010 to 2015, providing over £200m additional activity to the area would not take place, severely limiting the opportunities for innovation and growth, and not being able to support companies against threats posed by emerging new trends in manufacturing. Therefore, it is essential to have ERDF funding for the proposed operation.

4.3.2 Small Scale Operation

In the original ASTUTE Business Plan completed in 2010 it was mentioned that a possible post funding /continuation strategy for ASTUTE could be a small scale project involving the universities. We no longer believe this is an appropriate way forward. Due to substantial, continued demand from industry in WWV, a full scale operation for 2015 to 2020 is justified. The Universities are willing to contribute significant amounts of academic match funding to such an Operation. Extra resources are then requested from ERDF for project officers to carry out the collaborative research activities.

4.3.3 Provision of Funding to Companies or Universities?

There are two options to be considered here for the way the funding could be used:

a) Provide the funds directly to the companies so that they can establish their own specialist resources for facilitating innovation or subcontract as required.

b) Provide the funds to the Universities to enable them to work with companies with the aim of generating innovation.

If option (a) was pursued, then there would be a danger that companies would use the funds to subsidise normal business expenditure or for short term investment, rather than genuine long term research, development and innovation. Often the managers of companies are under considerable pressure from the day to day operational activities and are not in the best position to focus on the more strategic, longer term opportunities presented by RD&I. Even if they decided to use some of this money to approach Universities for "Contract Research" type projects, the unstable nature of this income for Universities would mean this route would probably not be cost effective and time consuming for both parties since no dedicated research staff would be available at the universities at the time of the company approaching them. Naturally, giving money directly to companies will also raise the issue of non-compliance with State Aid.

Alternatively, option (b) would ensure that companies draw down research expertise from Universities so that at the time of the company requirement there is dedicated research staff at the universities which, under the guidance of an academic, could deliver the work. The consequence would be that the request could be dealt with in a timely manner by the ASTUTE 2020 team increasing the value of the collaboration for companies. One of the strengths of the ASTUTE 2020 partnership will be to have highly qualified dedicated research staff already employed, enabling the partnership to respond in a timely fashion to requests from companies. It would also be possible to focus on RD&I with longer term benefits. As mentioned earlier in relation to Figure 4.1, companies may not have the correct mix of scientific expertise to fully appreciate the possibilities that could arise from company driven, applied research involving the wider skill sets associated with the Adaptive Smart Specialisations of the Universities. Ensuring the funds are spent in this way would effectively de-risk the investment in RD&I that often deters manufacturing companies.

As mentioned previously, the proposed operation is aimed at Specific Objective 1.2, which emphasises the need for improved technology transfer from HEIs. Within the ERDF Programme there are other priority areas aimed at providing direct funding to companies.

Therefore, the best option is option (b), providing the funds to the Universities.

4.3.4 Geographical Distribution of the Funds

The next question to ask is regarding the geographical area within which the recipient Universities should lie. There are a number of options here for distributing the funds:

a) To Universities across Europe

b) Only to Universities across the UK

c) Only to Universities in Wales

d) Only to Universities in WWV

The wider the geographical area, the greater the number of potential Universities that could be involved, and hence the greater the diversity of potential specialisations. However, our experience is that collaboration between Universities and companies is much more effective when they are in reasonably close proximity, as was also recently highlighted in a workshop in Brussels[29] where "regional closeness" was seen as a key for successful collaboration. There is then the opportunity to develop an ongoing relationship between the parties which can continue beyond the funding period.

The chosen area needs to be large enough so that the range of skills and specialisations available from the Universities within that area are able to meet the key requirements of the industrial base that requires the support. We have mentioned earlier that Wales has two Universities that are ranked in the top 10 UK Universities for Engineering, together with a number of niche areas of specialisation in the other HEIs which between them provide a coherent, focused and high quality expertise base upon which manufacturing firms across the WWV can draw.

It would thus be appropriate and reasonable to focus on the whole of Wales for selection of the University partners so as to selectively harness research excellence from both WWV and EW Universities. Thus the proposed option is (c), provide the funds to Universities in Wales.

4.3.5 Distribution of the Funds by Institution

We now look at the methodology for allocation of funds between the Institutions.

The previous section demonstrated that we need a collaborative operation of selected Welsh Universities to deliver the proposed operation. There are two options to consider here:

a) A partnership in which each institution has a fully pre-defined budget.

b) A partnership that is flexible in the way funds are shared between the partner institutions.

The advantage of option a) is that it provides stability and allows institutions to plan resources and

[29] EC DG Growth workshop "SMEs readiness factors for adopting Advanced Manufacturing products and modernise theirbusiness Challenges and Policy Actions", 10th February 2015. http://www.earto.eu/news/detail/article/ec-workshop-on-smes-readiness-on-10-february-in-brussels.html#sthash.cNJwLelC.dpuf

attract high quality project officer staff to work alongside the academics in their Adaptive Smart Specialisation areas.

Option b) would be useful in dealing with niche specialisations where there may be a danger that demand from manufacturing industry may not be sufficient (or may be of an intermittent nature) to justify appointment of staff for periods of up to five years.

Considering these two options, option a) is fully aligned with the WEFO guidance on delivery models for European Structural Fund Programmes. From experience and evidence, there is consistently strong demand for the current Adaptive Smart Specialisations planned in ASTUTE 2020 justifying pre-defined budgets enabling partners to plan long term. All beneficiaries are cooperating in the development, management and delivery of ASTUTE 2020 and will contribute financial and non-financial resources and so, as discussed in the chapter on '*Strategic Fit'* the following HEI partners/joint beneficiaries will be involved in ASTUTE 2020:

- Swansea University (lead beneficiary and core delivery partner)
- Cardiff University (core delivery partner)
- Aberystwyth University
- University of Wales Trinity Saint David

The fixed budgets associated with each potential beneficiary are specified in the chapters on '*Financial and Compliance'* and *'Value for Money'*. Direct delivery will be the main mechanism for ASTUTE 2020 and the partnership will implement most activities of the operation itself. There will be some elements of contracted delivery to external organisations for e.g. evaluation, State Aid advice, IP advice, horizon scanning, and industrial advisors (see chapter '*Financial and Compliance'* for further details).

Overall coordination and management of the operation will be carried out by the 'Coordination and Support Team' at Swansea University as the lead beneficiary. This team will consist of:

a) the Operation Director (OD), Professor Johann Sienz, who will lead and oversee the operation.

b) the Operation Manager (OM), Dr Anke Heuberger, who will monitor all administrative activity to ensure that ASTUTE 2020 delivers its outputs and that suitable systems are in place to ensure control of expenditure, that evidence gathering is appropriate and that the operation complies with State Aid regulations and any other known and relevant regulations. The OM will also chair the Operational Management Group and be responsible for marketing the operation and addressing any deviation from the agreed delivery and expenditure profiles. The OM will be supported by:

   (i) a Finance Coordinator, responsible for all financial aspects of the operation, in particular claims, verification and audits,

   (ii) a Targets and Procurement Coordinator, responsible for all matters relating to outputs of

the operation as defined by the agreed ERDF indicators and appropriate evidence collection, as well as for coordination of the procurement activity with emphasis on EU and institution regulation compliance,

(iii) a Legal and Contracts Coordinator responsible for delivery of all legal aspects of the operation in particular State Aid compliance, ASTUTE 2020 collaboration agreement, company collaboration agreements, data protection and document retention,

(iv) a Communication and Admin Officer responsible for all communication aspects of the operation, as well as for organizing all ASTUTE 2020 events and providing general administrative support for the Coordination and Support Team.

Each ASTUTE 2020 team within the joint beneficiary organisations consists of:

a) Academic experts who will ensure successful delivery of their institutions' elements of the operation, bring their world-class expertise to the interactions with enterprises through direct involvement on collaborative RD&I projects in a steering and advisory role and manage and steer the operation as part of the Executive Management Committee. Principal Investigators from all four HEI partners will also be part of the Project Committee (see section 4.8);

b) Project Officers (POs) who will normally be qualified to at least Masters level, but typically to PhD level, in the identified Smart Specialisation areas and whose primary role is to work with industry partners and the academic experts in a bridging role to deliver support for industry, primarily in the form of RD&I projects. For larger, more complex projects, one or more POs will work together potentially across different institutions, reporting to the technical lead for that specific activity, typically a Senior Project Officer.

c) Administrators: Each joint beneficiary will have one or more part- time or full time administrators for day-to-day administrative and logistical support across the RD&I projects, monitoring overall expenditure and ensuring that correct processes are observed and appropriate documentation completed and retained throughout, as well as maximising the impact of operation outputs through assisting in securing evidence for outputs achieved and in supporting the team's ongoing programme of technical events and collaborative project activities.

Swansea and Cardiff as the two core delivery partners of the operation will also employ:

a) Highly Qualified Senior Project Officers (SPO) who will be experienced engineers with an RD&I background to enable expertly and timely technical delivery of collaborative work. They will develop the portfolio of RD&I projects, with each SPO being responsible for leading activities in at least one area of Adaptive Smart Specialisation, and in managing and participating directly in the successful delivery of RD&I projects.

b) A Strategic Technology Manager (STM), Dr Jonathan James in Swansea and Andrew Hopkins in Cardiff, who will oversee the Technical Team and will have a key role in identifying and developing new collaborative RD&I opportunities with industry partners in dialogue with the WG SMART Innovation specialists. The two STMs (Swansea and

Cardiff) will also be part of the Operational Management Group which will oversee the day to day running of the operation (see section 4.8).

The distribution of activities, funding and outcomes by partner and by Adaptive Smart Specialisation is discussed in Appendix XVII.

4.4 Enterprise Interaction Mechanisms

4.4.1 RD&I collaborations

The main focus of ASTUTE 2020 will be on *Collaboration* between the partner Universities and the manufacturing based companies in WWV in RD&I projects with the aim of jointly researching, developing and trialling solutions and knowledge exchange between the parties involved. ASTUTE 2020 will draw on the academic expertise of its partner institutions for scientific input. The companies will bring to bear their expertise for their specific processes, products and applications. Table 4.1 shows an indicative overview of the anticipated RD&I projects and their duration needed to achieve the agreed targets and to generate the required economic impact. In the previous ASTUTE, approx. 65% of the industrial projects were between a few weeks and 11 months. ASTUTE 2020 aims to engage in longer, more strategic projects with duration of one year or above.

Table 4.1 ASTUTE 2020 RD&I projects

Indicative RD&I project duration	Indicative number of RD&I projects
3 months	4
6 months	8
1 year	6
2 years	10
3 years	12

We are currently discussing the most appropriate mechanism for costing HEI collaborations with WEFO.

4.4.2 Knowledge Transfer to companies in RD&I

A small part of the operation will be to engage and advise enterprises in innovation and R&D to promote technology transfer and to facilitate technology transfer activities in form of Knowledge Transfer to companies in RD&I.. Knowledge Transfer will encompass managing knowledge created by the research within the partner HEIs and will involve academics to provide input on key research and specialist areas. These activities will consist of acquiring, collecting and sharing explicit and tacit knowledge and can involve scoping discussions and signposting or feasibility studies with the potential goal of leading to the development and facilitation of RD&I collaboration activities (as described above). In some cases it might be required that a member of the ASTUTE 2020 team works in an enterprise in a newly created role for a limited amount of time in order to properly embed the knowledge into the company. These activities will mainly be one sided with the

universities providing industry with scientific know-how with no or little input from the industrial partner depending on the mechanism (please see Appendix XII).

4.4.3 Contract RD&I

In exceptional cases we envisage to engage in Contract RD&I whereby the enterprise will pay full economic costing (FEC) for the activities of the ASTUTE 2020 HEI partners. We expect this activity to amount to a small percentage of ASTUTE 2020's activity and any income will be re-invested into the operation's primary activities. Like all other ASTUTE 2020 activities, 'Contract RD&I' will also be research driven and this option can be offered to enterprises in the rare cases where they cannot provide the anticipated in kind input into a collaboration.

Further discussion on compliance of these interaction mechanisms with the State Aid legislation is provided in the chapter on '*Financial and Compliance'* and in Appendix XII.

ASTUTE 2020 will not be using a "Financial Instrument" as we will not be providing any cash directly to the companies, nor does ASTUTE 2020 rely on any cash contributions from the companies to the operation.

4.5 ASTUTE 2020 Impacts

ASTUTE 2020 will create an impact in the short term through delivery of outputs as defined by the ERDF indicator definitions and leave a lasting legacy for the manufacturing industry in WWV through e.g. net job creation, increase in turnover and company-level GVA. The project approval process will take into account the likely long term impacts as well as the more immediate outputs. Further details will be presented in the sections on '*Indicators and Outputs*' and *'Value for Money'*. In brief, we expect the most important outputs from our RD&I collaborations to be private investment in RD&I, employment increase, and new to the firm products and processes. Considering the achievements of the previous ASTUTE, the focus and concentration of ASTUTE 2020 and the changes in indicator definitions we anticipate the proposed operation to deliver as follows:

ERDF indicator definitions as per v1.2, January 2016	Selection of anticipated outputs for A2020
Private investment matching public support in innovation or R&D projects (£m)	5
Employment increase in supported enterprises	80
Number of enterprises supported to introduce new to the firm products	39

The likely distribution of these impacts by Adaptive Smart Specialisation is discussed in Appendix XVII.

4.6 Previous Track Record

Over the period 2010 to 2015, the ASTUTE project has received approximately £14 Million of ERDF Convergence Funding from the Welsh European Funding Office. Using this support ASTUTE created over £200m economic impact in its operation during this period[30]. As mentioned in the chapter on Strategic Fit, ASTUTE has achieved all the targets originally set for it and in most cases has substantially exceeded the target value for the key indicators. The independent Final Evaluation of ASTUTE in 2015[31] was very positive, as demonstrated by the following quote:

> "The ASTUTE Project and its achievements are an **exemplar of Industry/Academia collaboration**. The Project has remained true to its ambitions and its achievements can be attributed to a number of key success factors which it is **recommended are adopted as best practice for ASTUTE 2020 and also any further or future EU or government** funded academic projects."

Other outside views were equally positive:

> "Swansea University's ASTUTE project was raised as **being effective** and **the only true business support mechanism** aimed at helping **Welsh Manufacturing** companies. ….. **no other WG funded** support mechanisms were outlined as being **particularly successful** …. a number of companies highlighted that ASTUTE was seen as the programme of assistance that was being used in the main to deliver the larger scale projects in companies." [Manufacturing Supply Chain Development Study (The Centre for Supply Chain Operations and Procurement Excellence), 2014]

> "Programmes such as the **ASTUTE Project**, currently funded from Structural funds, need to be scaled up using Horizon 2020 funds. The Astute project allows Welsh businesses to access the latest innovations in advanced manufacturing from eight Welsh Universities to generate solutions to a wide range of manufacturing problems. **This project needs to be extended and used as a flagship programme for EU Research and Innovation spending**." [Kay Swinburne, MEP, 2014]

> "**Continuing** support for **excellent** pan-Wales R&D **collaboration** schemes such as **ASTUTE**, where universities in Wales provide state aid funded **R&D services** to Welsh-based enterprises **is important**. It not only makes enterprise aware of what can be achieved with R&D but also makes the universities more commercially focused." [An economic strategy for Wales?, IWA – Institute of Welsh Affairs, March 2015)]

These, and other feedback from inspections and audits, demonstrate that the ASTUTE partnership has an excellent track record in delivering EU funded projects.

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[30] Final Evaluation Report of ASTUTE, "Final Evaluation Report for the ASTUTE (Advanced Sustainable Manufacturing Technologies) Project" carried out by Ciotek, June 2015.

[31] Final Evaluation Report of ASTUTE, "Final Evaluation Report for the ASTUTE (Advanced Sustainable Manufacturing Technologies) Project" carried out by Ciotek, June 2015.

4.7 Legal Basis

Swansea University was the lead partner of ASTUTE and will be the lead beneficiary of the proposed ASTUTE 2020 operation. The University has been in existence since 19 July 1920, and was previously a constituent college of the University of Wales. It is a registered charity, registration no. 1138342 and its legal basis is set out in its Charter and Statutes. The Charter highlights the University's remit to: "to advance learning and knowledge by teaching and research, and to engage in activities to promote and contribute to cultural, social and economic development within Wales and beyond". The University Governance structure is also set out in the Charter and Statutes; these documents are available on request. Swansea is a major research-led University located within WWV and has both the infrastructure and capability to deliver on 'Strengthening research, technological development and innovation' through ERDF funding, and to lead the ASTUTE 2020 operation.

Cardiff University will be the other core partner (joint beneficiary) for ASTUTE 2020. Cardiff University was founded by Royal Charter in 1884. The University's administrative offices are at 30-36 Newport Road, Cardiff, CF24 ODE (East Wales region).The constitutional framework within which the University operates is based upon its Charter, Statutes and Ordinances. The Charter sets out the purpose and powers of the University. The Statutes amplify the Charter and both the Charter and the Statutes are approved by the Privy Council on behalf of Her Majesty the Queen. Ordinances support the Charter and Statutes and are created and approved by the Council. Other regulations may be created and approved by Council or by other committees on delegated authority from the Council. The Council is the governing body and, as such, the supreme authority of the University. It has the ultimate power of decision in all matters affecting the University. The Senate is the chief academic authority and is responsible, on behalf of the Council, for determining educational policy. The Court is a widely representative body that meets annually (usually in March). It is chaired by the Chancellor and receives the Annual Report and Financial statements. The University is a registered charity, registration no. 1136855, and is also registered with Companies House no. RC000089. The Council acts as the Board of Trustees of the charity. Each member of Council is also therefore a trustee of the charity. The University's strategy focuses on research and innovation, education, international and engagement. It has a world-leading research community with a strong and broad research base.

Aberystwyth University is a minor partner (joint beneficiary) in ASTUTE 2020, specialising in the application of software aspects relevant to advanced manufacturing. Aberystwyth University was established in 1872 and incorporated by Royal Charter in 1889. It is a research university located in Aberystwyth, Wales. Aberystwyth was a founding Member Institution of the former federal University of Wales and in 2007 was granted a Supplemental Royal Charter which enabled the institution to confer its own degrees and awards. Strong bonds of cooperation however remain with the other institutions formerly members of the University of Wales. Aberystwyth University is a registered charity. No 1145141. The Business Registration number is: RC000641. (01/01/1900). The University's address is: Aberystwyth University, Old College, King Street, Aberystwyth, Ceredigion, SY23 2AX.

University of Wales Trinity Saint David (UWTSD) is a minor partner (joint beneficiary) in

ASTUTE 2020. UWTSD was formed in November 2010 through the merger of the University of Wales Lampeter and Trinity University College Carmarthen under Lampeter's Royal Charter of 1828 (the oldest in Wales). In August 2013, Swansea Metropolitan University became part of UWTSD. The UWTSD Group also includes Coleg Sir Gar and Coleg Ceredigion as part of a dual sector group structure comprising further education colleges and the University. The objectives of the University are to advance education and disseminate knowledge by teaching, scholarship and research for the public benefit. The University is a registered charity, registration no.1149535, and is also registered with Companies House no. RC000537. The University's administrative offices are at Carmarthen Campus, College Road, Carmarthen, SA31 3EP.

Compliance with State Aid legislation is an essential consideration for operations such as ASTUTE 2020. This has to be demonstrated both in terms of potential State Aid to the companies we collaborate with and also potential State Aid to the Universities. Details of our State Aid approach are explained in the section on "*Financial and Compliance*".

4.8 Governance

Delivery of ASTUTE 2020 will be controlled by a strong governance structure which improves the one successfully used in ASTUTE over the period 2010 to 2015. This will involve the following groups:

- An **Executive Management Committee (EMC).** This will oversee all strategic activities and will report to WEFO.
- A **Project Committee (PC)** with relevant external industrial representation which will carry out an expert review of all company projects including proposals and status reports.
- An **Operational Management Group (OMG)** which will deal with day to day running of the operation.
- A **Stakeholder Advisory Board (SAB)** which will involve representatives of the various, relevant stakeholders to provide guidance and inform our strategy.
- A **Finance Committee (FC)** which will meet by exception if there is a need to significantly alter the budget distribution between partners.

Details of the membership of these groups and how they will interact are included under the section on "*Management of Operation*", along with an explanation of the procedures for approving company projects. This strong governance structure will also prevent potential disruption as a consequence of turnover in key management positions.

4.9 Primary Risks and Dependencies

The primary risks associated with the proposed operation can be divided into four areas which are assessed below. A more comprehensive risk register is presented in the Appendices and this register is a live document that is updated as the operation progresses.

- **Risk of Non-Compliance with State Aid legislation.** We have taken professional legal

advice and the operation will deliver under a set of pre-defined mechanisms, to ensure State Aid compliance. Further details are included in the chapter on *"Financial and Compliance"*.

- **Risk of Not Achieving Targets.** Proposals for all individual company projects will be reviewed by an expert panel consisting of an appropriate mix of academic specialists and relevant industry representatives. One of the key criteria for project approval will be the likelihood that the project will contribute to the overall targets of the ASTUTE 2020 operation.

- **Risk of Private Sector Displacement.** This will also be taken into consideration when developing project proposals, and if there is significant risk of this occurring, the proposal will be rejected and the company signposted to the private sector. A robust, well defined project approval process will minimise this risk and the relevant industry representation on the PC will have a specific role in advising on such issues should circumstances arise.

- **Risk of Not Completing or Retaining Sufficient Documentary Evidence.** We appreciate the need to retain documentation relating to procurement, other financial purchases, staff appointments etc. We will continue with the robust procedures that have been in use over the past five years in ASTUTE. The good management of documents has been highlighted in the Mid-Term and Final Evaluation.

4.10 Innovative Aspects of the Proposed Operation

The proposed operation is geared to deliver innovation in high value manufacturing in WWV. Many of the delivery mechanisms are tried and tested and have worked well in the previous ASTUTE project. However, there are a number of aspects where we will be using new and innovative practices, examples of which are given below.

4.10.1 New Technology Areas

Through our Adaptive Smart Specialisations we will be introducing a number of new innovative focused technology areas where there is evidenced demand from industry. A good example is the area in smart manufacturing combining robotics/automation with data acquisition and higher level decision making processes where companies may have limited knowledge of this technology and can benefit from the impartial knowledge and expertise available from ASTUTE 2020. This has the potential to add considerable value to products and processes and we are ideally placed to identify opportunities for this with the many manufacturing companies we have dealt with under ASTUTE and also the new companies that we will collaborate with under ASTUTE 2020.

4.10.2 Targeting Transformational Benefits

It was mentioned earlier that one of the key aims of ASTUTE 2020 is to enable transformational, not just incremental, growth within the companies we collaborate with. We present here how our innovative use of Adaptive Smart Specialisation can be applied to achieve this, using an analysis based on perceived risks of project failure.

If we think of a company considering a range of options for RD&I projects, they will generally evaluate the potential benefits of each project and balance these against the risks of each. Often the

higher the potential benefit of a project to the company, the higher the risk that the company perceives to be associated with that project.

Frequently, companies will be deterred from taking on high risk projects as they lack the necessary specialised expertise to maximise the chances of success. Yet it is just such projects that could have the highest potential to enable transformational change within the companies and yield significant economic growth for Wales.

The key point we wish to introduce here is that just because a company may perceive an RD&I project as risky, it does not necessarily mean that others will have the same perception of that risk. It could be that a University with the correct specialisations will have a totally different perception of the risk associated with a particular RD&I project.

So there are two essential elements for us to consider in deciding which type of project to undertake in ASTUTE 2020:

- The potential economic impact on the company, and
- The risk, as perceived by the *Universities*, of a project failing to achieve its desired outcome.

These are represented as axes in Figure 4.2, and will be taken in to consideration by an expert panel who will evaluate each proposal.

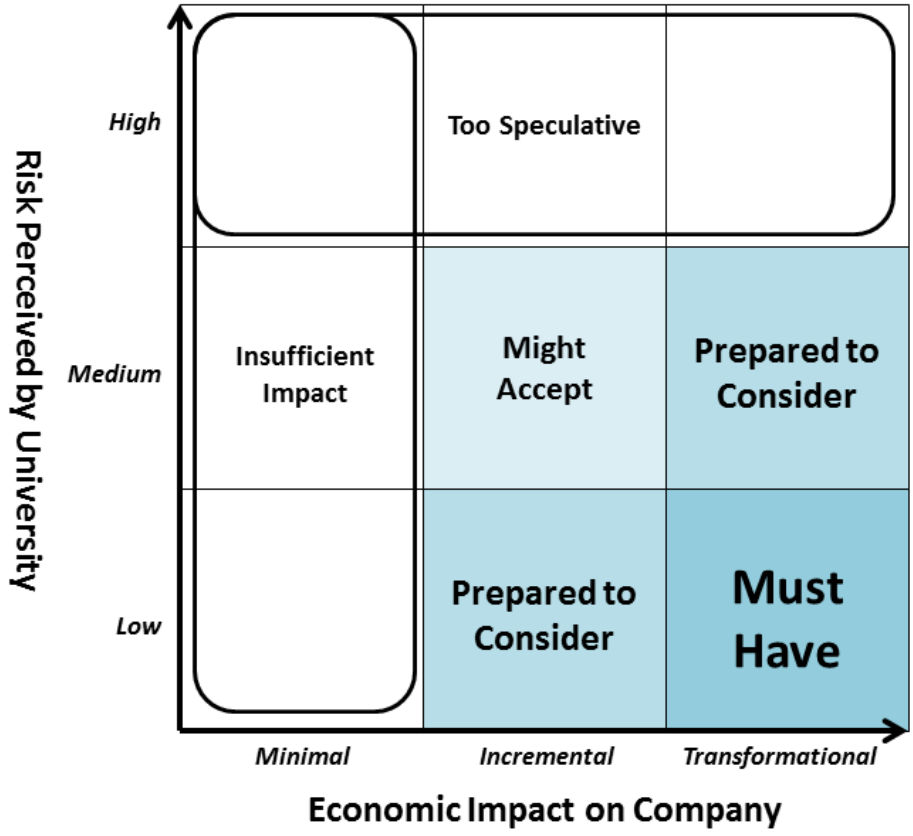

Figure 4.2 Prioritisation of projects for ASTUTE 2020 and two areas to be avoided.

In terms of considering the potential economic impact on the company, our preference is for those projects that can have a transformational impact. We can consider those with incremental impacts, but we would want to avoid those with minimal impacts.

It may well be the case that potential projects with transformational impact would be perceived as being high risk by the *Company* without any outside help. However, the critical issue to consider would be the *University's* perception of project risk, which may well be different from that of the Company.

If our own perception of the risk of project failure is too high then we would conclude that the project is too speculative to take on, regardless of the Company's perception of risk.

However, if we believe that applying our Adaptive Smart Specialisations to the project will significantly reduce the risk, then it could be a very desirable project for us to undertake, even if the company would otherwise perceive it as high risk.

In line with GBER legislation and once the Project Committee has formerly approved such projects, we anticipate that some collaborative projects will be run using an aid intensity that will be higher than 50%. For example, in certain circumstances GBER Article 25, paragraph 6, permits aid intensities of 70 to 80% for small enterprises engaging in industrial research. This would encourage small enterprises to take on collaborations where they have limited resources to contribute, whilst at the same time sharing the risk between the parties in a manner compliant with the maximum aid intensities specified by GBER.

Much of what the last ASTUTE has done has involved projects perceived as medium risk by the company, and with our help we have been able to generate incremental benefits to the company through technical collaboration. In ASTUTE 2020 we will expand our portfolio of projects to include projects that can also yield transformational benefits to the company.

Thus Figure 4.2 gives us a conceptual framework for selection and prioritisation of projects with companies. The diagram also indicates two areas that ASTUTE 2020 will seek to avoid:

- **Projects with Insufficient Impact.** These are projects where, although ASTUTE 2020 can work with the firm to help provide a technical solution to the company's requirements, the resulting economic impacts within the company would be too low to justify the expenditure of WEFO funds in this way.

- **Highly Speculative Projects**. Any potential projects that the Universities perceive as being high risk (regardless of the Company's perception of risk). Public funds should not be used to pursue very speculative research when the chances of commercial benefit being realised in WWV are remote. This could be because (i) there is a very much reduced chance of us providing a technical solution, (ii) we can provide a technical solution, but the chances of economic gain are small, or (iii) we can provide a technical solution and there is a reasonable prospect of economic gain, but it is unlikely that this economic gain can be captured in WWV. In these cases we will loosely signpost the companies that approach us with these requests to other sources of help, which could include, for example, some of the following depending on the nature of the enquiry:

- EPSRC
- Nesta[32] (formerly the National Endowment for Science and the Arts)
- Innovate UK
- Venture Capitalists
- Business Angels

[32] http://www.nesta.org.uk/get-funding

5 Indicators and Outcomes

To evaluate progress through ASTUTE 2020, we have defined a set of indicators and other measures as presented in Table 5.1 Where appropriate, we have also specified an anticipated target level for some of these, and the rationale for the chosen figures is covered in a later section. The table also shows which are ERDF outputs that will be included in claims to WEFO, which are additional measures that will be included in progress to WEFO and which will be measured by external evaluation. We will continue to work with WEFO and the external evaluators for the inception evaluation to identify appropriate indicators that measure the operation's impact.

Table 5.1 Indicators and other measures to be used for ASTUTE 2020.

ERDF = ERDF Output, R = Reporting, E = External Evaluation

Group	Indicator/Measure		Output Level
Activity Evidence	Enquiries, referrals and other initial contact with companies	R	
	Referrals to other Welsh Government schemes	R	
	Referrals to private sector	R	
	Formal requests for collaboration from companies	R	
	Number of enterprises co-operating with supported research institutions	ERDF	40
	Number of enterprises receiving non-financial support	ERDF	42
Innovation Evidence	Number of patents registered for products/processes	ERDF	5
	Private investment matching public support in innovation or R&D projects	ERDF	£5 Million
	Number of items of non-patent IP retained by supported enterprises	R	
	Scientific papers that include a supported company as joint author	R	
	Publically available case studies on projects with supported companies	R	
	Number of enterprises supported to introduce new to the firm products/processes	ERDF	39
	Number of enterprises supported to introduce new to the market products/processes	ERDF	8
	Number of REF Impact case studies supported	R	
	Amount of RD&I research income achieved	R	
Growth Evidence	Employment increase in supported enterprises	ERDF	80
	Additional jobs created in supported enterprises	R	
	Jobs created in other organisations	R	
	Jobs safeguarded	R	
Long Term Benefits	Further increase in employment	E	
	Increased investment by the company	E	
	Increased spend by the company in local supply chain	E	
	Increased external investment into the company	E	
	Predicted increase in sales revenue	E	
	Predicted increase in export revenue	E	
	Savings in energy, GHG emission and waste	E	

Our Monitoring and Evaluation plan that will be developed over the next few months will further consider these and other indicators, specify evidence requirements and details for monitoring and evaluation. A draft will be prepared and discussed with WEFO in time for the inception evaluation and finalised with input from the evaluation. We will monitor the ERDF indicator levels attained throughout the operation to ensure they reach the specified indicative target levels. The additional indicators will just be reported, i.e. there will be no target level associated with them.

It should also be emphasised that it is the official ERDF indicators that will be given priority when we assess proposals for projects with companies.

In the table we have placed the indicators into four separate groups in what we consider is a logical sequence. The first group are related to the activities that will be carried out by the ASTUTE 2020 staff (RD&I collaborations, Knowledge Transfer to companies in RD&I and Contract RD&I).

The aim of all these activities will be to generate *Innovation* which can be evidenced by Intellectual Property and introduction of new products and processes as shown in the second group.

Manufacture of new products should encourage growth which can be measured by e.g. employment increase, as shown in the third group. The second and third groups will thus represent measures that will be achieved in the short to medium term.

The *Longer Term* benefits listed in the fourth group are then likely to be achieved over a time frame that extends beyond the life of the ASTUTE 2020 operation. In these cases it will be more appropriate to employ external evaluators to predict these economic impacts.

In Appendix XVII we have made an approximate prediction as to the possible split of the ERDF targets between the three areas of Adaptive Smart Specialisation.

5.1 Activity Evidence

In order to achieve the output indicators outlined in Table 5.1, the principal activities that will take place will be projects involving one or more HEI partners of ASTUTE 2020 and one or more manufacturing enterprises in WWV. We are estimating that there will be around 40 of these projects, and each of these can be counted towards the ERDF indicator "***Number of Enterprises co-operating with supported research institutions***". All enterprises to which ASTUTE 2020 will provide innovation support, be it via collaborations or Knowledge Transfer activities, will be counted towards the indicator ***"Enterprises receiving non-financial support".*** As each enterprise can only be counted once, we are expecting to deliver 42.

Furthermore, we will also use some additional indicators that will be helpful in monitoring progress to set up projects with companies. When ASTUTE 2020 first receives an enquiry from a company, or a referral from an external organisation, this will be logged under the indicator "***Enquiries, referrals and other initial contacts with companies***". We will record the company details irrespective of whether we are able to provide support. In some cases it may be more appropriate to signpost the company to other schemes run by the Welsh Government/WEFO, in which case we will record this under the indicator "***Referrals to other Welsh Government schemes***", along with

the details of which project they were referred to. There will also be instances where we would refer the enquiry to existing solution providers in the private sector, and we will then use another additional indicator "***Referrals to private sector***".

In many cases, after an initial discussion with the company, they will wish to proceed to requesting support from ASTUTE 2020. The detailed procedure for this engagement is described under the chapter on '*Management of the Operation'*. The first step in this process will be for the Managing Director or nominated person to complete and sign a "Request for Industrial Project" form that we will use as a basis for an initial decision in principle on whether support can be provided. Upon receipt of this a record will be kept of the form and it will be counted under the indicator "***Formal Requests for Industrial Project from Companies***". There will then be a two stage process to filter out potential projects that do not have sufficient economic impact potential.

5.2 Innovation Evidence

Most of our industrial projects will require the companies to make a formal contribution to the project from their own resources. We will record these contributions under the ERDF indicator "***Private investment matching public support in innovation or R&D projects***". We are aiming that there should be at least £5 million of private investment that can be counted as a result of ASTUTE 2020 activities in this area.

From the activities described above, the projects that we undertake with companies will generate significant amounts of new knowledge which can in many cases be the basis for different types of intellectual property, which can include:

- Patents
- Registered Designs
- Confidential Know-How

In other cases it may not be practical to protect the knowledge, but advantage can still be gained for companies via publication which can raise the scientific prestige of the company.

Any of the above examples can be regarded as evidence of the innovation process, along with the successful incorporation of the knowledge into new and improved products processes and services.

From our experience in ASTUTE over the period 2010 to 2015, we have found that most manufacturing SMEs are more effective at protecting the knowledge gained by using confidential know-how (backed up by non-disclosure agreements) than they are at utilising patents.

Companies are often reluctant to patent in order to keep their IP out of the public domain. A further issue is that protecting IP with patents is often done by the "geographically mobile" companies that want them. So even if the patents protect the invention, it may fail to prevent the benefits from being taken outside WWV. Only around five companies took out patents in the last ASTUTE and we estimate that we will not be able to achieve more in ASTUTE 2020. Instead, we propose to also report on 'non-patent' IP.

"Non – Patent IP" could be:

o Design Rights, Registered Designs etc.

o Confidential know how or any other knowledge gained by the company through the ASTUTE 2020 project, that they wish to keep confidential in order to gain an economic advantage.

o To evidence this, the company will have to make a statement like: "We have gained specific knowledge through the ASTUTE 2020 project, related to <include here a basic description that the company would be prepared to state – i.e. not compromising the details of the confidential information> and wish to keep this confidential" signed by MD or another senior person. In projects that do not generate any patent (the majority, well in excess of 95% in ASTUTE) the non-patent IP will show that IP was created and is being used for the benefit of the company. It should be emphasised that patents are a means to an end, not an end in itself.

In the very few instances where the ASTUTE 2020 intervention might lead to a patent, due to the nature of this intervention and the likely subsequent work needed to convert this into a patentable outcome we anticipate that this will again involve other interventions (e.g. WG, private sector), who might need to claim this output for themselves.

We note WEFO's concern that a statement from the MD might not be sufficient evidence. The inception evaluation will look closer into possible evidence requirements and other means of recording non-patent IP, keeping in mind that companies should not be overburdened with paperwork.

It is important to demonstrate the quality of the scientific knowledge generated through the collaborative activities, and with the consent of the companies concerned, scientific papers will be written and published in expert reviewed journals and conferences. The relevant people from the companies will be included as joint authors of the papers if they wish and this will form the basis of an additional indicator "***Scientific papers that include a supported company as joint author***". Once a paper has been peer reviewed and accepted for publication by a relevant journal/conference it will be counted towards the number for this indicator.

Irrespective of whether the technical results of a project are patented, protected or published we will also encourage the company to produce a short case study of the work that can be quickly disseminated into the public domain. This will help publicise the ERDF funded work of ASTUTE 2020 and will comply with any publicity requirements that WEFO have. We will count these under an additional indicator "***Publically available case studies on projects with supported companies***".

Naturally the knowledge generated from the activities will have commercial benefit when it is incorporated into innovative new uses and adaptations of existing technology, processes or services.

Two of the quantities that we will use to measure this will be the ERDF indicators "***Number of enterprises supported to introduce new to the firm products/processes***" and "***Number of enterprises supported to introduce new to the market products/processes***". Our estimate here is that most of the projects will result in products/processes that can be classed as sufficiently new to the firm to warrant inclusion in this indicator within the lifetime of ASTUTE 2020, so we have set a target level of 39. Due to the nature of the intervention we are anticipating a significantly lower number of enterprises to introduce 'new to the market products/processes' and we have set a target

level of 8.

In addition, should ASTUTE 2020 projects with collaborating companies lead to further public support (e.g. Innovate UK projects) for these companies, then we will record these in the separate category "***Amount of RD&I research income achieved***".

The impact of the collaborative work could – following scientific publication – lead to impact as defined in the REF guidelines. We aim to capture this in the category "***Number of REF Impact case studies supported***".

5.3 Growth Evidence

It is a key objective for ASTUTE 2020 to ensure that innovation leads to economic growth. An important measure that we will use here is the ERDF indicator "***Employment increase in supported enterprises***", where we are aiming at a target of 80. The official definition[33] for this indicator states that:

"This is essentially a 'before-after' indicator which captures the part of the employment increase that is a direct consequence of project completion"

It is our intention here to interpret "project completion" as completion of any distinct *phase* of a project. This is because we are aiming in ASTUTE 2020 to have longer, more strategic projects which will probably encompass several phases over a period of perhaps two to four years. If, for example, a company states that it has increased employment as a consequence of completion of phase 1 of a project that is still ongoing, then we consider it reasonable that these jobs are counted, even though the overall project may not have finished. Employees taken on during the project will be recorded provided they are still employed beyond the end of the project, particularly if the employee is involved in knowledge transfer during the project.

ASTUTE 2020 will collaborate with SMEs and with MNEs with a local presence in WWV such as Tata for example. With such MNEs it is virtually impossible to actually measure this indicator in this specific case of a company spanning five continents. Therefore, we would interpret this as an indicator applied to the local operational base with which ASTUTE 2020 collaborates.

We will also record data against some additional indicators described below.

"***Additional jobs created in supported enterprises***" will include any jobs created in the supported enterprises that cannot be counted under the official ERDF indicator described above. Evidence will still be required in terms of employment contracts and sign off from an appropriate person in the company.

"***Jobs created in other organisations***" will cover the creation of other jobs in WWV outside the

[33] Welsh European Funding Office, European Structural Funds Programmes 2014-2020, Guidance on Indicator Definitions, Data and Evidence Requirements, ERDF: Priority Axis 1: Research and Innovation, Version: 1.0, Date: April 2015

directly supported enterprises. This could include jobs created in companies who are suppliers to, or customers of, the supported enterprises. It can also include jobs created within the partner Universities located within the WWV area. Again evidence of employment will be required coupled with sign off from a suitable person in the management of the organisation that these have been created as a consequence of the ASTUTE 2020 operation.

"***Jobs safeguarded***" may not be immediately recognised as a growth measure, and will not be one of our priorities when selecting projects. However, we feel it will be essential to record this where it occurs, as it does increase the chances that a company can subsequently grow when it implements better processes and launches new products. Additionally, in cases where the collaboration with a company increases the productivity and with it improved long term prospects for the company, the outcome in the short term might be no new employment.

5.4 Long Term Benefits

ASTUTE 2020 will generate substantial long term benefits for the companies supported and the economy of WWV. Much of this will be realised beyond the timescale of the operation and will include the following:

- Further increase in employment,
- Increased investment by the company,
- Increased spend by the company in the local supply chain,
- Increased external investment into the company,
- Predicted increase in sales revenue,
- Predicted increase in export revenue,
- Savings in energy, GHG emission and waste.

The indicators described in the previous sections can be recorded and/or monitored by evidence gathered by the staff of ASTUTE 2020. However, the measures described for the long term benefits are more appropriately quantified by external evaluations performed by expert consultants who have experience in this type of work. This approach was used for the ASTUTE project 2010 to 2015, where the final evaluation valorised long term economic benefits to WWV in excess of £200 million.

For ASTUTE 2020 we will procure three external evaluations over the lifetime of the project. These will involve independent, procured specialist consultants who will conduct detailed interviews with supported companies and other stakeholders.

5.5 Rationale for Stated Target Levels

As can be seen from Table 5.1, there are seven indicators where we have specified indicative target levels and in this section we present our rationale for choosing these values.

Our overall reasoning is based on our historical experience gathered over the last five years in running the ASTUTE project where we have dealt with a large number of companies in WWV and

secured evidence for a range of ERDF output and result indicators against targets specified in the ASTUTE Business Plan in 2010. Anticipated targets for ASTUTE 2020 have been estimated on the basis of the results and impact from ASTUTE projects in the three Adaptive Smart Specialisation areas. It has to be noted that a comparison between ASTUTE projects and ASTUTE 2020 projects is difficult because of the different nature as outlined below and because of changes in the economic situation.

5.5.1 Number of Enterprises Co-operating with Supported Research Institutions

Under the new definition for this round of funding enterprises can be counted several times for different projects and that might occur in ASTUTE 2020 in some cases but the operation's aims are longer, strategic collaborations with high impact. The staff resource profile has been determined on that basis. Longer, more strategic collaborations will lead to higher levels of 'Private sector contributions' and higher 'Employment increase' and we therefore aim to carry out 40 cooperations (collaborations) over the next five years.

5.5.2 Private investment matching public support in innovation or R&D projects and Employment increase in supported enterprises

As ASTUTE 2020 collaborations will be longer on average than those in ASTUTE, it is difficult to compare a typical ASTUTE 2020 collaboration with a typical ASTUTE collaboration. On average we have generated one job and £90k of private investment per collaboration in the three Adaptive Smart Specialisations in the historic ASTUTE. With longer, more strategic collaborations, we estimate that each ASTUTE 2020 collaboration will, on average, generate £125,000 of private investment (£5m in total) and an employment increase of two Jobs (80 in total). Please note, a key contribution from ASTUTE 2020 is jobs safeguarded against the backdrop of a severe continued global economic downturn affecting many manufacturing sectors in the globally highly competitive manufacturing industry which is of significant size in and of high value to the Welsh economy. Safeguarding is very high on the agenda for the Welsh Government who only recently supported a local engine plant with £15m to "… secure hundreds of jobs that may otherwise have been in jeopardy." [http://www.bbc.co.uk/news/uk-wales-south-east-wales-34359399]. This investment of £15m was part of a total investment of £181m to safeguard 600 jobs. It will also support jobs in the supply chain, but this would be common for ASTUTE 2020 activities resulting in jobs safeguarded as well. This example shows the level of investment needed to safeguard jobs. Creating jobs or stimulating the creation of jobs will typically require even higher investment.

5.5.3 Number of enterprises receiving non-financial support

In ASTUTE we recorded a total of 300 for the "Enterprise Assisted" indicator, which required seven hours of support. However, as mentioned previously, ASTUTE 2020 will be concentrating on long term projects that will achieve transformational benefits for the companies. Consequently, the primary focus of the Operation will not be on very short term work with companies. As a consequence the numbers of enterprises recorded as receiving "non-financial support" will be considerably less. These will involve activities carried out under the 'Collaborative RD&I' and the 'Knowledge Transfer' mechanism. We anticipate that out of the 40 collaborations, approx. 10% of the enterprises will engage in more than one project. As a minor activity for ASTUTE 2020, we are looking to carry around 15 feasibility studies or short research projects that will help assess the

potential for collaboration. We expect that around 50% of these will turn into collaborations. As each enterprise can only be counted once under the 'Enterprises receiving non-financial support' indicator, we are expecting to deliver 42 over the duration of the operation.Number of patents registered for products/processes

5.5.4 Number of patents registered for products/processes

ASTUTE 2020 is less concerned with product development but mainly with process development and improvement, or manufacturability of products. Experience during the last ASTUTE shows that companies are very reluctant to patent new processes in order to keep their trade secrets out of the public domain. We would also expect patents to derive from fundamental research in TRL/MRL levels 1 to 3 and not so much from TRL/MRL levels 4 to 6. In fact, only one in every ten projects in the Adaptive Smart Specialisations has led to patents in the last ASTUTE. With a more focussed project selection process we estimate that one in every 8 projects in ASTUTE 2020 will lead to a patent (5 in total).

5.5.5 Number of enterprises supported to introduce new to the firm products/processes

Not all of the 40 collaborations will result in new to the firm products. Based on previous experience and with a more focussed project selection process, we anticipate a success rate of 90-95% of collaborations and possibly some of the feasibility studies under 'Knowledge Transfer' (section 5.5.3) resulting in new to the firm products (and/or processes). So the target for this indicator will be 39.39

5.5.6 Enterprises supported to introduce new to the market products/processes

ASTUTE 2020's remit is to work in the high value manufacturing sector and mainly concentrate on TRLs/MRLs 4 to 6. We therefore consider our intervention to be one of the steps on the journey to develop 'new to the market products/processes' but we recognise that the final steps towards commercialisation will have to be supported by the private sector and/or other interventions to pick up the work when the projects progresses to the higher TRL/MRL levels. Due to the nature of the intervention, ASTUTE 2020 will not be able to support enterprises on their complete journey to commercialisation and other interventions will have to be involved to realise the eventual outcome. ASTUTE 2020 will be looking to monitor further developments/interactions and outcomes after our technical work has been completed. Further discussions with the respective third parties will then have to take place in order to determine who can claim the target for "***Number of enterprises supported to introduce new to the market products/processes***". In view of the recent update in the guidelines we have set a target level of 8 for this indicator. The inception evaluation will provide further clarity on whether this is appropriate and achievable. Progress for this indicator will be monitored closely and the situation will be revisited in the mid-term evaluation.

5.5.7 Operation Plan

Where we have included target levels for the indicators in Table 5.1, we have also made a prediction of the likely, indicative levels that will arise on a quarterly basis over the duration of the project. These predicted figures are included in Appendix VIII. We will report on the actual levels realised on a quarterly basis to WEFO, and discuss these numbers at the regular meetings of the

Executive Management Committee and Stakeholder Advisory Board. Appropriate action can then be taken should the level of achievement fall substantially behind that predicted.

5.6 Monitoring

Our plan for monitoring the indicators described above will be similar to that successfully used in ASTUTE over the period 2010 to 2015. A more detailed 'Monitoring and Evaluation Plan' will be drafted before the inception evaluation and revised and finalised in discussions with WEFO taking into consideration the inception evaluation results.

As described in the section on '*Management of the Operation'*, we will have a dedicated Coordination and Support Team in place to collect and verify evidence required for the indicators. Within this team, there will be a specific person, the Targets and Procurement Co-ordinator, who will be responsible for collecting this data from the partner HEIs in the first instance. This person, and the Coordination & Support Team in general, will ensure all partners are fully aware of the data reporting requirements for the ASTUTE 2020 operation.

As in the ASTUTE project, we will have a specific set of forms to be signed off by the companies for each indicator used. For the ERDF indicators these will follow the instructions laid down in the published guidelines[34].

Responsibility for delivering the indicators and collection of the evidence for these will lie with the complete ASTUTE 2020 team, but specifically with the Senior Technical Managers and/or Project Officers in the Technical Delivery Teams of the individual HEIs who directly engage with the industrial collaborators. In addition to leading the technical projects, they will also carry out a number of post project follow-up visits to all companies and will liaise with the company management to ensure forms are correctly completed and signed off along with the appropriate evidence. This documentation will then be passed to the Coordination & Support Team for additional verification that the evidence provided is accurate and sufficient for audit purposes. In cases where the evidence is complex (e.g. financial evidence), the Coordination & Support Team will be able to use their collective experience in making an impartial judgement which will be one step removed from the technical officers who collaborate directly with the companies. This will ensure a high level of data quality.

The Coordination & Support Team will be responsible for reporting this information to WEFO at quarterly claims, presenting it at WEFO review meetings, and making it available for audits and inspections. This data will also be reported to the management bodies outlined in the section on '*Management of the Operation'* so that appropriate action can be taken if indicators fall behind targets.

In addition, there will be wider information used for management and evaluation. This will include

[34] European Structural Funds Programmes 2014-2020, Guidance on Indicator Definitions, Data and Evidence Requirements ERDF: Priority Axis 1: Research and Innovation. Welsh European Funding Office, Version: 1.2, January 2016

'Requests For Industrial Project' forms, 'Project Proposal Forms' (part of the project approval processes described in the next section), and 'Project Status Reports'.

There are also Enterprise Data Requirements, as set out in the annex of the guidelines[35] on indicators that will need to be completed for each company supported. These are quite extensive, so we will commence this process at the initial enquiry and project proposal stage (basic information such as Company Registration Number, address, contact details and size). We will then collect more detailed information such as the demographics of the owners when the project proposal has been approved.

Baseline evidence of the companies for indicators like 'Employment increase' and 'New processes' will be collected at project proposal approval stage and these will include such information as Total FTEs employed, together with an outline organogram of the structure (see example in Appendix IX).

5.7 Evaluation

All monitoring data will be made available for external evaluation of the ASTUTE 2020 operation, which will be carried out by subcontracted consultants. There will be three evaluations over the course of ASTUTE 2020. The question of private sector displacement will be an integral part of all three evaluations.

An inception evaluation will be carried out within 6 months after business plan sign off for the Operation and will involve consultation between the independent evaluators and the stakeholders. This will help form the baseline against which progress can be assessed for the mid-term.

The "Formative" evaluation will be completed just before the half way point of the operation as shown in Table 5.2. The result of this will then allow any necessary modifications especially of the Adaptive Smart Specialisations to take place in the second half of the operation. The "Summative" evaluation will provide an overall assessment of the operation and valorise the lasting benefits.

Table 5.2 Timetable for External Evaluations of ASTUTE 2020.

Procurement of Evaluations	Quarters 1 to 2
Inception Evaluation	Quarters 1 to 2 after BP sign off
Dissemination of Inception Evaluation	Quarter 3 after BP sign off 6

[35] European Structural Funds Programmes 2014-2020, Guidance on Indicator Definitions, Data and Evidence Requirements ERDF: Priority Axis 1: Research and Innovation. Welsh European Funding Office, Version: 1.2, January 2016, Annex A

Mid-Term (Formative) Evaluation Commences	During Quarter 7
Mid-Term (Formative) Evaluation Completed	End of Quarter 9
Dissemination of Mid-Term (Formative) Evaluation Report	Quarter 10
Review of Report and Action Plan by Executive Management Committee and WEFO	Quarter 11
Final (Summative) Evaluation Commences	During Quarter 14
Final (Summative) Evaluation Completed	Quarter 19
Dissemination of Final (Summative) Evaluation Report	End of Quarter 20

The methodology to be used for the Formative and Summative Evaluations and the appropriateness of the chosen indicators will be discussed with the consultants and WEFO. The consultants will liaise with WEFO for their input into the evaluation methodology and also interview key stakeholders such as Welsh Government, Principal Investigators of ASTUTE 2020 at the partner institutions and possibly some of the Project Officers.

Dissemination of the Mid-Term (Formative) Evaluation will be initially to WEFO, the Executive Management Committee of ASTUTE 2020 and the Stakeholder Advisory Board. All of these will be invited to comment. At that time consideration will be given as to whether it would be useful to put the report into the public domain and/or or share it with other ERDF operations, so that best practice and/or lessons learned can be shared for mutual benefit. There will then be an opportunity for the Executive Management Committee of ASTUTE 2020 to consider any actions that may have been recommended by the report. Dissemination of the Final Evaluation will follow a similar route. These actions will also be informed by horizon scanning exercises carried out with industrial representatives and independent consultant(s).

6 Management of Operation

The proposed operation will work inside the Swansea University oversight structure for major projects for general oversight and risk management. ASTUTE 2020 will be governed by five principal management groups, each with a specific function. All strategic activities will be overseen by an Executive Management Committee, chaired by the Operation Director. The personnel involved with ASTUTE 2020 will be divided into Technical Delivery Teams at each HEI, with an additional Coordination & Support Team at Swansea University managed by the Operation Manager.

The benefits of working with ASTUTE 2020 will be promoted to Manufacturing Companies across WWV. For those that wish to collaborate we will then have a three stage process for project selection and approval.

6.1 Governance

Swansea University as the lead beneficiary has a robust system in place for the oversight of Major Projects. Figure 6.1 provides an overview of the SU oversight structure. The University Senior Management Team (SMT) provides oversight of all University projects in delivery via the Major Projects Board which is chaired by the Pro Vice-Chancellor with responsibility for major projects. The purpose of the Major Projects Board is to oversee the delivery of all University major project commitments. The Major Projects Board -

- defines and manages the list of major projects,
- reviews and approves project management standards,
- handles and resolves common project issues and risks,
- monitors performance of projects in delivery,
- monitors sustainability performance of projects,
- escalates any key risks or issues to SMT.

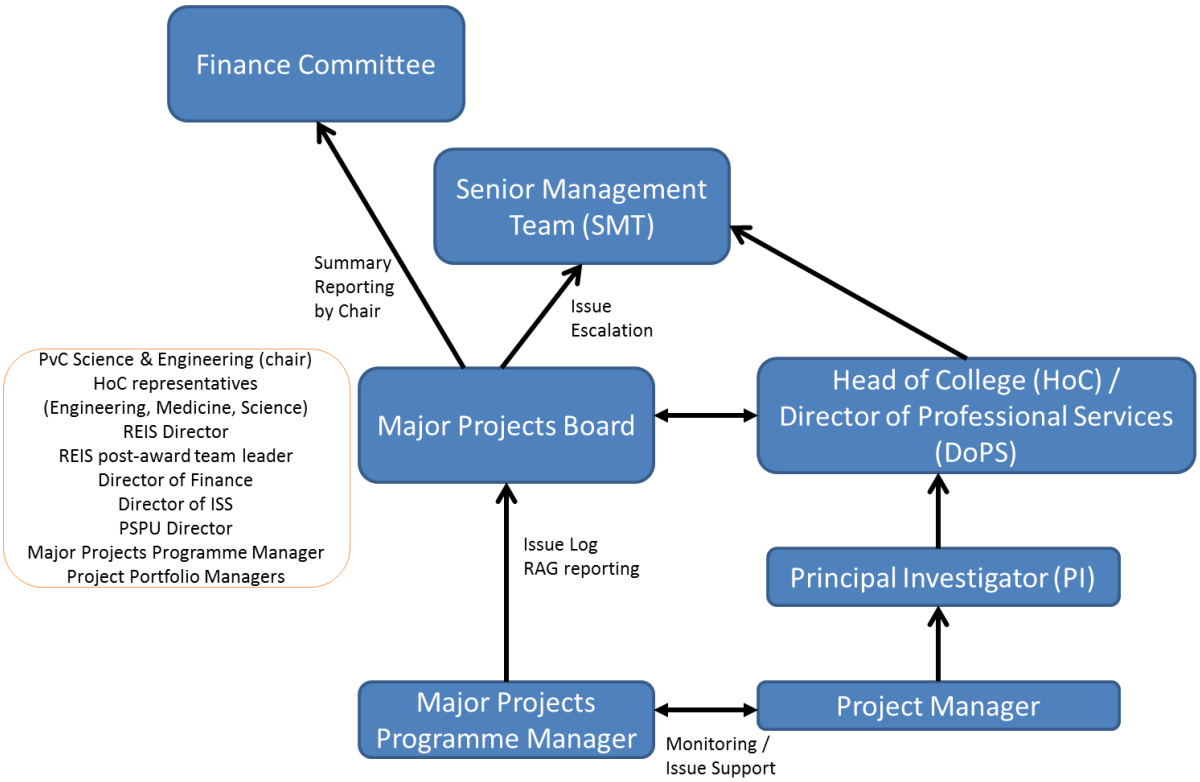

Figure 6.1 Overview of Swansea University's generic oversight structure for Major Projects

The proposed ASTUTE 2020 operation covers four partner HEIs within Wales who will be interacting with a large number of businesses. It is therefore essential to have a robust governance structure in place to ensure efficient delivery of the operation.

6.1.1 Senior Responsible Officer

The Senior Responsible Officer (SRO) for the Operation will be the Head of the College of Engineering at Swansea University. Currently this is Professor Steven G.R. Brown.

6.1.2 Key Personnel with Responsibility for Delivery

The SRO will have oversight of the ASTUTE 2020 Operation via the College of Engineering reporting structure and membership of the SAB. However the three people with key responsibility for the delivery of the Operation at Swansea University will be:

- The Operation Director, Professor Johann Sienz
- The Operation Manager, Dr Anke Heuberger
- The Strategic Technology Manager, Dr Jonathan James

Professor Sienz has been the Director of the highly successful past ASTUTE project over the period 2011 to 2015. He is also Director of Innovation and Engagement and Deputy Head of the College of Engineering at Swansea University. His role in ASTUTE 2020 will be to take overall strategic lead for the operation, act as Chairperson of the Executive Management Committee, and be accountable directly to WEFO for all strategic matters and the successful delivery of the operation.

The ASTUTE Director will be backed up by two Deputy Directors, Professor David A. Worsley, Director of Research and Deputy Head of the College of Engineering at Swansea University and Professor David T. Gethin at Swansea University. Each of the other partner HEIs will nominate a lead Principal Investigator (PI), who will be responsible for their Institution's contribution to the ASTUTE 2020 operation.

6.1.3 Management Groups

The overall management structure of the operation will involve five principal management groups drawn both from partner Universities and Stakeholders. The structure is presented in Figure 6.2 and details of the purpose and membership of each is described below. Further details are provided n the Partnership Agreement in Appendix X.

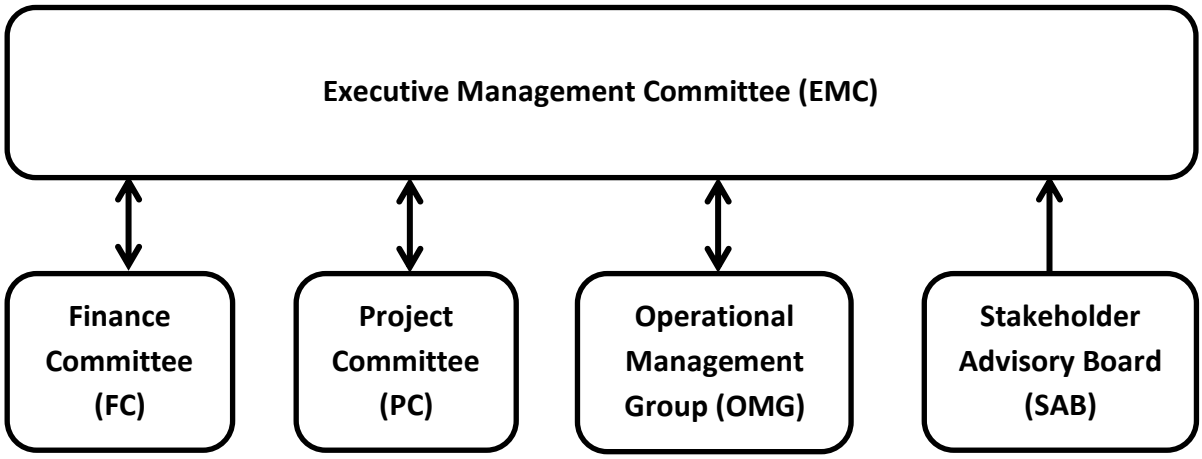

Figure 6.2 Principal management groups for the ASTUTE 2020 Operation

Executive Management Committee (EMC)

The purpose of this group is to oversee and direct all strategic activities and monitor overall performance of the ASTUTE 2020 operation. It will meet bi-annually or more frequently if required.

The EMC will not normally make decisions on project proposals, but will review, and where appropriate modify, the criteria used by the Project Committee (PC). The EMC will also oversee the Horizon Scanning Exercises that take place, and will also act on recommendations arising from the Mid Term Evaluation.

The three leaders of the Adaptive Smart Specialisations will all report to the EMC.

The Director of ASTUTE 2020 will also be the Chairperson of the EMC and this committee will report directly to WEFO through the Director and the Operation Manager.

Stakeholder Advisory Board (SAB)

The purpose of the SAB is for external stakeholders working with the joint beneficiaries to advise and consult with the EMC of ASTUTE 2020. The key aspect here is that it is essential to obtain relevant representation from a) the manufacturing industry in WWV as this is the target group that ASTUTE 2020 is aiming to deliver benefit to and b) the private sector engineering design providers as there could be a perceived overlap of their services and the support that ASTUTE 2020 offers Industry Wales and EEF The Manufacturer's Organisation are part of the SAB to ensure that these industrial groups are appropriately represented and help identify opportunities for collaboration and referral and minimise the risk of private sector displacement.

The SAB will be chaired by the PVC Major Projects from Swansea University, currently Professor Stephen P. Wilks. It will meet annually or more frequently if required. The SAB will have representation from all partner HEIs and the regional boards as well as Industry Wales and EEF.

Operational Management Group (OMG)

The OMG will carry out the day-to-day management tasks of the operation. It will involve personnel from the two core partners, Swansea and Cardiff Universities. The group will meet on a bimonthly basis or more frequently if required and will be chaired by the Operation Manager.

Finance Committee (FC):

This committee will only meet by exception, when there is a need to make changes to the overall distribution of the funds to the partners. An instruction for this group to meet must be made by the Executive Management Committee.

Project Committee (PC):

The purpose of the Project Committee will be:

a) to approve proposals for company projects to be carried out under ASTUTE 2020,
b) to review project status reports for projects that it has approved, and
c) to comment on the project approval criteria.

The Committee voting members are:

- Operation Director (Chair), Swansea University
- One Deputy Director, Swansea University
- Lead PI, Cardiff University
- Industry Wales representative
- EEF representative

The PC will meet in person annually (or more frequently if required) and will review proposals for projects and status reports for ongoing and completed projects, offline via electronic communications. During the six months mobilisation phase the committee will meet in person more frequently. Beyond that, we are confident that by meeting offline it will be possible to get prompt decisions on project proposals within an industrially relevant timescale without sacrificing the robustness of the process. We have gained extensive and positive experience using an offline electronic review process of proposals during ASTUTE over the period 2010 to 2015.

All project proposals will be sent to the PC (and copies are circulated to all PC members), but the way the PC handles proposals will vary slightly according to size, as measured by the amount of ASTUTE 2020 resources to be contributed to the project:

- For projects under £10k, the Operation Director and the respective Adaptive Smart Specialisation leader(s) will approve the proposals.
- For projects between £10k and £50k, the approval decision is taken by the vote of the PC members and the respective Adaptive Smart Specialisation leader(s).
- For projects over £50k, the proposal must also be circulated to the PIs of all partners (i.e. to Aberystwyth and UWTSD) and the respective Adaptive Smart Specialisation leader(s) for them to assess and approve the proposal.

It is important to note, that the approval criteria used are the same for all cases, irrespective of the project value category and the number of experts involved in the approval process. The approval procedures are further detailed in section 6.4 and the Appendix.

The PC will report to the EMC. It will use the project approval criteria to arrive at a decision on each proposal that is submitted via one of the HEI partners. These criteria can be varied by the EMC where appropriate. The Operation Manager will gather responses from all members of the PC and inform the HEI(s) that submitted the proposal of the decision that has been reached. A formal decision letter will also be sent to the collaborating industrial partner(s).

6.2 Human Resource Requirements and Administrative Team Structure

Delivery of ASTUTE 2020 will be carried out by highly qualified technical people with expertise in the Adaptive Smart Specialisations, supported by a team of experienced administrators who will be essential to ensure that accurate audit-ready records are maintained, State Aid legislation is complied with and all necessary reporting is done in a professional and timely matter.

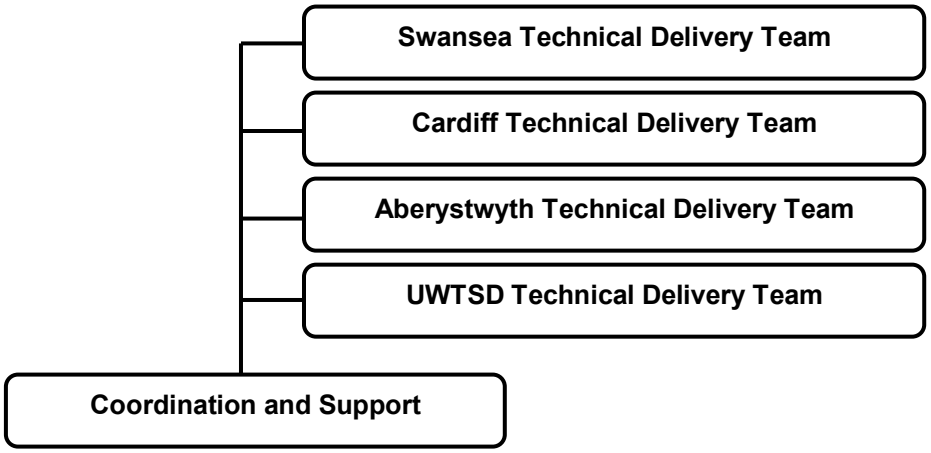

Figure 6.3 Overall administrative team structure for the ASTUTE 2020 Operation

The technical personnel will be distributed in several Technical Delivery Teams based at the partner HEIs as shown in Figure 6.3. Each of these will be supported by the Coordination & Support Team, which will be based at Swansea University.

6.2.1 Coordination & Support Team

The structure of the Coordination & Support Team is shown in Figure 6.4.

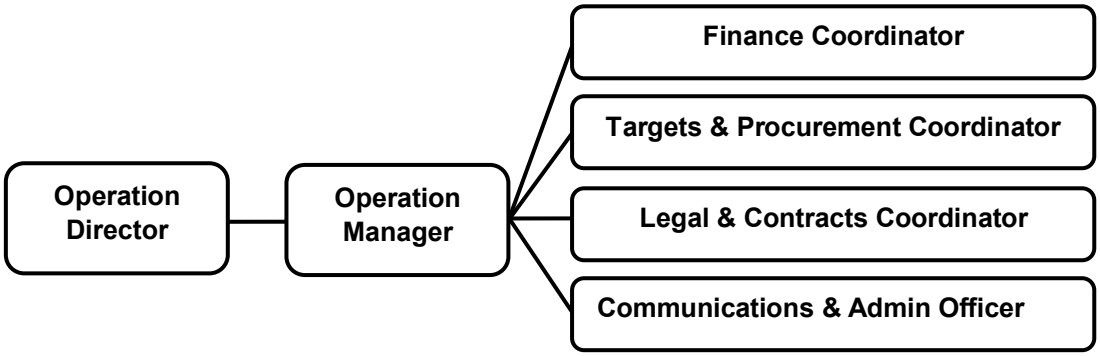

Figure 6.4 Organogram for the Coordination and Support Team

Central to this team will be the Operation Manager who will report directly to the Operation Director, Professor Johann Sienz. The Coordination & Support team will deal with all the central administration requirements, such as finance, claim verification, procurement, recording of indicators, reporting, drafting legal documents for Collaborative RD&I projects, liaison with stakeholders, general communications and project closure.

We anticipate several all team workshops to share best practice, to develop links between the teams and to raise awareness of each others' detailed technical capabilities.

6.2.2 Technical Delivery Teams

The Technical Delivery Teams will have a generic structure as shown in Figure 6.5. There will be at least one senior academic who will act as Principal Investigator (PI) along with additional academic members of staff who will contribute time (as match funding) to the operation by giving expert advice and technical steer to the Project Officers. Depending on the size of the team there may then be a Strategic Technology Manager and one or more Technical Managers (Senior Project Officers) who will have responsibility for developing and managing the company projects on a day to day basis, delegating work as appropriate to Project Officers.

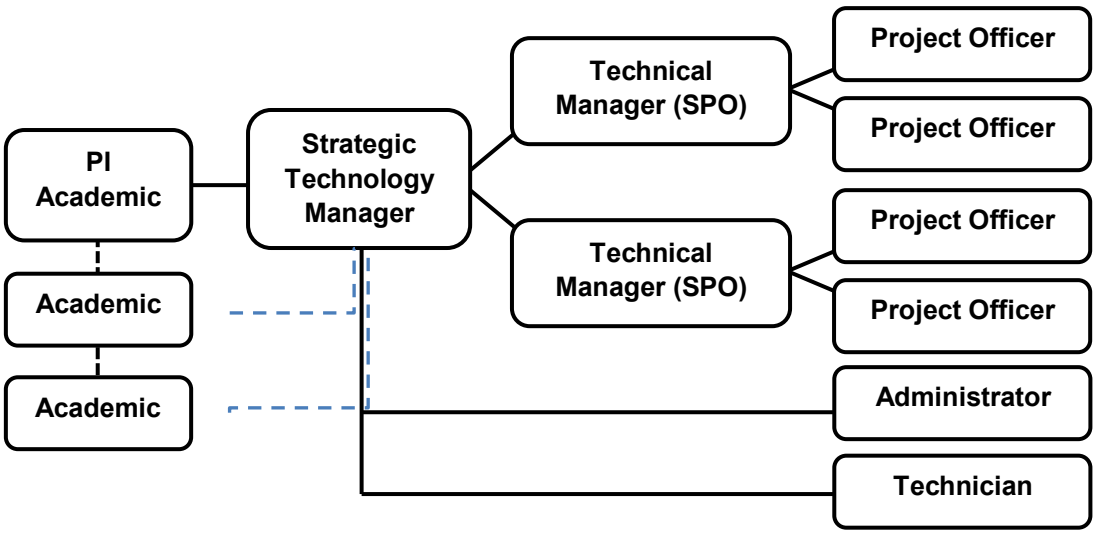

Figure 6.5 Generic Organogram for the Technical Delivery Teams

The Strategic Technology Managers and Technical Managers will usually be qualified to at least PhD level or equivalent experience (in areas corresponding to the Adaptive Smart Specialisations). The majority of Project Officers will have doctoral level qualifications in the Adaptive Smart Specialisations, and the larger teams will also have some support from an administrator and/or an IT or workshop technician. It should be emphasised that the exact structure of each team will depend on the size, with the larger teams having several Technical Managers and Project Officers, while the smaller teams may only have a single Project Officer with no Manager.

6.2.3 Management of Staff

Figures 6.4 and 6.5 indicate the overall structure for the staff concerned. All staff will be managed in accordance with the HR policies of the relevant HEI, and their performance indicators will normally be set and monitored by their line managers. The overall performance, awareness of and alignment with ASTUTE 2020 objectives of each team will be the responsibility of the Principal Investigator in each case. It is anticipated that each of the technical delivery teams will have an agreed set of targets based on the overall operation indicators described in the chapter on "*Indicators and Outcomes*".

The above indicative description of team structures is based on the individual institutions that will be partners in ASTUTE 2020. We would like to emphasise, however, that we anticipate a considerable amount of collaboration and interaction between the partner institutions and this will be aligned with the Adaptive Smart Specialisations. There will be company projects that involve more than one HEI and these will be recorded, monitored and reported to WEFO.

6.2.4 Continuity Processes

The Coordination & Support Team will ensure that a strong link is maintained between all the technical delivery teams and the business plan for the ASTUTE 2020 operation. All paid staff recruited to the technical delivery teams will be required to attend an induction session with the Coordination & Support Team, so that they are fully briefed on the aims of ASTUTE 2020, the Standard Operating Procedures and other topics such as State Aid legislation and the need to avoid private sector displacement.

6.2.5 Exit Strategy for Staff

It is expected that the majority of staff appointed to ASTUTE 2020 will be employed on fixed term contracts. In each case the exit strategy for staff will be determined by the relevant HR policy of the HEI concerned. Usually this involves a period of redeployment opportunities for staff within their own institution when the end of their fixed term contract approaches. We also expect a number of ASTUTE 2020 personnel moving to the permanent academic staff base at the partner institutions following standard competitive recruitment procedures for normal academic appointments as has happened in the previous ASTUTE project and already in the current ASTUTE 2020 operation.

6.3 Promotional Activity

ASTUTE 2020 will offer many benefits and opportunities to a wide range of manufacturing companies across WWV. It is therefore essential that the operation is promoted via a range of different media which are described below. A marketing plan will be developed and revised throughout the operation as appropriate.

6.3.1 Operation Website

As with ASTUTE over the period 2010 to 2015, a detailed bilingual website will be produced listing the Adaptive Smart Specialisations of the partners and giving an overview of the opportunities available. Details on our collaborative RD&I projects will be published on the website to open new opportunities for collaboration. We have already reserved appropriate domain names (*astute2020.wales* and *astute2020.cymru*) using the new top level domain names that were made available in early 2015.

6.3.2 Bilingual Flyers

A set of flyers will also be produced that will cover an overall brief summary of the ASTUTE 2020 Operation. Welsh and English language versions will be produced and they will be both in printed form and as electronic pdfs that can be disseminated via email.

6.3.3 Advertising Policy

Advertising of the operation to companies in WWV will be carried out using the flyers, website and social media accounts, relying mainly on e-media to reduce the environmental impact. We already have an extensive database of manufacturing companies in WWV and we will update this and use it as a basis for direct marketing. We are also anticipating referrals from Welsh Government representatives.

6.3.4 Technology Awareness Events

Throughout the period 2010 to 2015 ASTUTE has held a range of technology awareness events for manufacturing companies and we will organise more of these for the ASTUTE 2020 Operation.

6.3.5 Social Media

Social media can be a powerful tool allowing captive audiences to view your information instantly. ASTUTE 2020 will benefit with accounts through Twitter, Facebook, LinkedIn Group, & Flickr as well as others that may be suitable in the future. Using social media allows the audience to connect

and interact with ASTUTE 2020 on a more personal level. By providing information via these platforms we will be able to attract new audiences as well as encouraging them to stay. It allows research into other areas of what is going on in other sectors, competitors and get visibility of other initiatives. Networking through these platforms can contribute to knowledge sharing and word-of-mouth referrals. The ease of use enabling ASTUTE 2020 to publicize information instantly and repeatedly will ensure we have the latest information available to our audiences.

6.3.6 Stakeholder Engagement

In addition to direct marketing activities, we see engagement with a variety of stakeholders as an ideal mechanism for promoting ASTUTE 2020. We would therefore aim to talk directly to representatives of Welsh Government schemes that interact with industry and also the fora such as Industry Wales and EEF as well as the Regional Boards. Many of these organisations will be represented on our Stakeholder Advisory Board described earlier in this chapter. We will keep a record of all referrals of companies to and from the various stakeholders so that we can monitor this process and enable continuous improvement.

6.3.7 Publicity for Results and Impact

Many of the technical results of the work carried out under ASTUTE 2020 will be published in peer reviewed scientific journals or conferences. In addition we will encourage all companies we work with to produce short, one page case studies of the work which will be publically available via the ASTUTE 2020 website. These will describe the benefits to the company that have arisen and the anticipated economic impact, while ensuring non-disclosure agreement compliance.

6.3.8 Dissemination of Best Practice

Based on the results of the Final Evaluation of ASTUTE carried out by Ciotek Ltd., we will further analyse our operating procedures. We will then disseminate what we consider to be the best practice throughout the HEI partners of ASTUTE 2020.

Furthermore, the mid-term and final evaluation reports of ASTUTE 2020 will be disseminated to WEFO and all other stakeholders to allow the maximum amount of learning to be drawn from the operation and to highlight any future actions should these be needed.

6.3.9 Acknowledgement of EU funding

Full acknowledgement of the ERDF funding for ASTUTE 2020 will be included in the marketing material and scientific publications described above. In designing this material we will adhere to the WEFO Information and Publicity Guidelines and we will include the appropriate ERDF logo. We will also incorporate text along the lines of:

> ***"ASTUTE 2020 has been part-funded by the EU's European Regional Development Fund through the Welsh Government."***

or any other wording that may be recommended by WEFO. All our marketing material will clearly reflect the intention of the operation to avoid ambiguity about a perceived overlap with private sector activities.

We will also use appropriate Commemorative Plaques that will be available from WEFO - we will site these at the main office hub in Swansea and ask all HEI partners to do the same. The ASTUTE 2020 website will include the ERDF symbol on the home pages and full acknowledgement will be made of the European Funding. Any other literature we produce, including forms for collection of company data etc. will also include the logo and appropriate wording. This will ensure that enterprises are clearly aware of funding received from the EU, and all ASTUTE 2020 staff will emphasise this in their initial discussions with new companies.

6.3.10 Flying the EU Flag

During the week that includes 9 May we will partake in appropriate HEI activities to raise public awareness of EU projects such as ASTUTE 2020. A further option could be to hold one of our proposed events during this week.

6.3.11 Liaison with WEFO's PR Manager

Before any press releases are issued regarding ASTUTE 2020 activity, and before any public events are organised on our behalf, we will consult with the WEFO PR Manager for specific advice and guidance.

6.4 Project Selection and Approval Procedures

We anticipate that the promotional activities described above will generate numerous enquiries from companies wishing to benefit from the ASTUTE 2020 operation.

Ensuring the right collaboration and assistance is provided to the right companies will be key to the successful delivery of ASTUTE 2020. The ASTUTE 2020 Industrial Project Selection Criteria and Approval Process have been loosely based on the Innovate UK process for selecting and approving Collaborative R&D projects that involve industrial companies working with Universities. The Project Approval Process involves two stages and will use criteria grouped into the following three sections:

- The Advanced Manufacturing Innovation Opportunity
- The Project/The Research Challenge
- Funding and Compliance

The full procedure is outlined in Appendix XI. The process is initiated by a "Request for Industrial Project" (RFIP). This triggers a two stage procedure which will be used to assess and approve all proposals for company projects.

The first stage will be at a local level by the PI in the respective partner institution. This will enable unsuitable projects to be filtered out at an early stage, and avoid putting the company through a protracted procedure that may then result in disappointment.

If the RFIP is approved, then the second stage will commence which will involve the development of a full proposal. This will be prepared by the staff of both the company and ASTUTE 2020, and will then be presented to the Project Committee (PC) for a decision on whether the project is

approved.

The PC and EMC will continually review the effectiveness of this new procedure and will introduce amendments where appropriate. Most of the refinements have been made during the mobilisation phase (the first six months of the Operation).

6.4.1 Approval Criteria

Two sets of criteria will be applied in making the decisions. The first set of criteria will be used at the RFIP stage and the second set at Project Proposal stage. The mobilisation phase of the operation has been used to define these criteria, develop a scoring matrix and to fully implement the process.

The first set of criteria will include:

Company Details:

- Confirmation that it is a trading company
- Confirming the company has a base within WWV
- Ensuring the work maps on to the Business Plan
- State Aid Compliance
- Ensuring the work will not obviously displace the private sector
- Validity of documentation

The Advanced Manufacturing Innovation Opportunity:

- What is the business opportunity that this project addresses?
- What is the size of the market opportunity that this project might open up?
- What would be the economic impact on the company?
- How will these (and any other) benefits remain long term in WWV?
- Likelihood of contribution to main ERDF targets of ASTUTE 2020

The Project:

- What is the nature of the research the company wants from collaboration with ASTUTE 2020?
- Preferred State Aid Compliance Mechanism – to be discussed with the ASTUTE 2020 Project Officer (normally Collaborative R&D – indicate reason for choosing otherwise).
- What is the potential contribution from the company if Collaborative R&D is proposed?
- Could this work be carried out by the private sector?
- Estimated value of Enterprise and ASTUTE 2020 input
- Area(s) of Adaptive Smart Specialisation

The second set of criteria will then include:

- Research challenge
- Risk of private sector displacement

- Novelty of what is proposed
- Innovation potential of the company
- Position within Readiness Levels
- Risk Perceived by University and Economic Impact on Company
- Alignment with Adaptive Smart Specialisations
- Assessment of potential impact and contribution to required outputs, etc
- Economic Benefits to WWV
- Importance of the project for the enterprise
- Confidence that the benefits are likely to have a long term impact in WWV
- Compliance with the EU RD&I framework and state aid regulations
- Overall Value for Money

Many of these criteria (e.g. Research Challenge, alignment with Adaptive Smart Specialisations, compliance with the EU RD&I framework and state aid regulations) have been included with a view to minimising any further risk of Private Sector Displacement or "leakage", i.e. generate impact not being realised in WWV.

6.4.2 Overall Procedure for Project Proposals

The procedure for evaluating proposals is presented in Figure 6.6. The final, executive decision on all proposals will lie with the Operation Director as accountable person. S/he will have to sign off final versions of all proposals that have been accepted. The PC and EMC will reserve the right to review the effectiveness of these procedures and implement modifications if necessary.

It should be emphasised that the two stage process and the interaction of company staff with ASTUTE 2020 staff in preparing the proposal should minimise the risk of full rejection of the proposal at the PC stage.

Where RFIPs or Project Proposals are rejected, every effort will be made to fully explain the reasons to the company and to signpost the company to other solution providers, either in the private or public sector if possible. All rejections/referrals will be logged in the database.

6.4.3 Extension of Projects

In some cases it will be necessary to extend the duration of a project and/or increase the amount of ASTUTE 2020 resources contributed to a project. Extensions by duration only without additional resource requirement can be agreed between the Project Officer and the enterprise. Written agreement from both parties (email communication) will have to be kept on file. Extensions that require additional resources will have to be approved either by the Operation Director or by the PC depending on the value. Extensions to projects involving increased resources of less than either 25% of the original contribution or £10,000 can be approved by the OD. Extensions to projects involving increased resources of more than either 25% of the original contribution or £10,000 will need to go back to the Project Committee and will be considered as a new phase of the project.

6.4.4 Procedure for Dealing with Micro-Companies

One of the lessons learned from ASTUTE over the period 2010 to 2015 (confirmed by the final

evaluation by Ciotek Ltd) is that many projects with micro-companies do not create significant economic impact. There have been one or two notable exceptions to this, but it is essential that we introduce a greater level of scrutiny in the approval process so that we minimise the risk of by far less productive projects with this category of company. There is thus a branch in the procedures to deal with these cases.

The key thing to bear in mind from the outset will be to manage the expectations of the micro-company. If the company does wish to proceed after the initial discussion with ASTUTE 2020 staff, they should submit an RFIP. The company will also need to complete a detailed "Micro-company form" which will give full details on the background to the company, who the directors are, and an outline of their business plan.

The ASTUTE 2020 staff will then give detailed scrutiny to this document and may undertake additional checks on the company via Companies House data etc., or in cases where the company was referred to ASTUTE 2020 share information with the referring party observing any data protection guidelines to better understand the potential of such a project. If necessary, further information can be requested from the company. The aim will be for the company to provide a convincing, written case that it will be able to make a significant contribution to the economy of WWV and that it can meet its contribution obligations. Only when ASTUTE 2020 are fully satisfied with the company background can an initial decision be made. The procedure from this point on could then be similar to that for a standard company.

6.4.5 Management of Conflict of Interest

In the event that any ASTUTE 2020 staff member or academic may have a conflict of interest with regards to a proposed company project, then the following will apply:

- The person concerned should follow their own University's policy on Conflict of Interest.
- They should declare and explain their interest in the proposal to the Lead PI for ASTUTE 2020 at the partner University concerned and to the Project Committee.
- They should play no part in the project approval process nor in any project assessment/decisions, and abstain from any vote that takes place on the proposal.

6.4.6 Signposting Outside ASTUTE 2020

In relevant cases we will be signposting enquiries outside ASTUTE 2020. When this happens we will provide reasons to the person or company who made the enquiry and will log this in a database which will include the destinations to which the signposting was done. This is mentioned in section 1.11.6 of the '*Strategic Fit'* chapter.

We also anticipate signposting of projects to relevant government operations or the private sector after completion and where appropriate.

6.5 Preparation for Delivery

Chapter 7, '*Financial and Compliance'* and the Appendix provide details on the Operation Plan. ASTUTE 2020 will be divided into three phases:

(i) Continuity and Mobilisation Phase,
(ii) Development and Initial Delivery Phase,
(iii)Delivery and Exit Strategy Phase

It is anticipated that the first phase will last around six to twelve months. Our aim is to keep this first phase as short as possible and the key activities will be:

- recruiting technical and administrative staff that will be required for delivery of the operation,
- finalising ASTUTE 2020's operational procedures,
- developing project proposals from the project pipeline, and
- commencing delivery of RD&I collaborations.

Note that it may be a few months before the details of the first set of operational procedures of ASTUTE 2020 are finalised. During this time any delivery of company projects etc. will follow the procedures used by ASTUTE over the period 2010 to 2015. We expect, just like in ASTUTE, that the operational procedures will evolve during the delivery of ASTUTE 2020 to capture best practice.

6.5.1 Technical Delivery Staff

It is important to note that the calculation of resources used for delivery of the operation and needed to deliver the indicative targets set for the indicators is based on person hours over the full five year duration. However, we can make a very rough estimate of the numbers of technical delivery staff that will be involved, and this will be as follows:

Swansea University Technical Delivery	Approximately 20 FTE from 1 July 2015 – this will vary over the duration of the Operation and will decrease in the last year. We have made a very rough estimate for the annual profile of FTEs over the project lifetime as follows: Year 1: 20 FTEs Year 2: 19 FTEs Year 3: 19 FTEs Year 4: 18 FTEs Year 5: 5 FTEs We would like to emphasize that we need to retain some flexibility in this profile. There will almost certainly be cases where people leave and it takes several months to find a suitable replacement. The numbers above can therefore only be an indication and actual values will vary to enable the ASTUTE 2020 team to have the right personnel resource level as dictated by the person hours.

Cardiff University	Averaging 7.2 FTE over 5 years
Aberystwyth University	1 FTE from 1 April 2016 for 3.5 years
UWTSD	2 FTE from 1 April 2016 for 3 years

These figures do not include the academics that will be providing match funding, further details on how the match funding contribution has been calculated can be found in section 7.8.8. Depending on project delivery and available person hours, these FTE numbers might be exceeded.

6.6 Procurement and Tendering

All purchases will follow the correct procurement channels as defined in the WEFO procurement guidelines and as such will be defined by the specifications published. State Aid advice will be procured before the beginning of the operation to run throughout the duration of the operation to ensure compliance of ASTUTE 2020's State Aid approach with respective legislation. This will ensure that spend is not improperly aggregated and the State Aid advice can be provided on an ad-hoc basis.

There will also be a need for a tender for an inception, mid-term and final evaluation. The inception and mid-term evaluation will be procured together with an optional add-on for the final evaluation providing that funding will be available for the final phase. We will use a similar format to that previously used for this specification.

All partners are looking to purchase items below £25,000 whereby the procedure will follow the individual HEI's policies and financial regulations. Procurement for items above £25,000 is only expected for the lead beneficiary. Procured items and purchases under frameworks have been identified in the Delivery Profile.

6.6.1 Swansea University

The current procurement procedures set by the Welsh Government and by Swansea University have been reviewed and the stricter of the two approaches for each procurement threshold will be adhered to as follows:

Threshold (excl. VAT)	**ASTUTE 2020 Procurement guidelines for Swansea University**
< £5000	One written quote as a minimum, and where possible, two verbal quotes with a note made on the order form of the verbal quotes. Quotes must be sought prior to placing the order.

£5000 - £24,999	Request for between 3 - 6 written quotes by writing up a specification of the requirement including the criteria (eg. lowest cost) that is going to be used for the evaluation of the quote submissions, copies of which kept as evidence. Choose the quote which offers best value for money. If this isn't the cheapest one then please provide an explanation on the 'Request for Purchase Order Approval Form'.
£25,000 - £173,000 (Goods & services)	Full tender process undertaken in collaboration with central procurement. A detailed specification will be required for the goods/services being procured, including a full breakdown of the scoring criteria that will be used to evaluate the tender responses. All appropriate timescales will be followed. Tenders should be invited using the "e-tender" system and advertised on sell2wales, in accordance with the tender procedures.
>£173,000	All procurements above this value must be undertaken in accordance with the UK procurement regulations and in collaboration with central procurement following all EU Procurement timescale requirements. A detailed specification will be required for the goods/services being procured, including a full breakdown of the scoring criteria that will be used to evaluate the tender responses.

Conflict of interest

It is possible that a person connected with staff (such as relatives, business partners or friends) may wish to tender for a contract being offered by ASTUTE 2020. This is not prohibited but appropriate safeguards will be put in place so that procurement procedure is conducted as openly and as transparently as possible in accordance with the WEFO Eligibility Rules for the 2014 – 2020 operational programme.

Members of Staff: It is prohibited for the University to place an order with a member of staff in their personal capacity or with a company in which a member of staff has a personal interest. Exceptions apply where the University has created a spin out company and a member of staff has a personal interest in that company then it shall be permitted for the University to place orders with the spin out company provided that:

The University's Purchasing Procedures have been complied with,

The member of staff that has an interest is not involved in any way in the procurement process.

The Head of Procurement's approval has been obtained for contracts up to £5k

The Head of Procurement and the Director of Finance's approval has been obtained for contracts over £5,000 but below £50,000 and

The Vice Chancellor's approval has been obtained for contracts above £50,000k in value.

The member of staff who has an interest in the spin out company is responsible for ensuring that full details of all work undertaken on behalf of the University are recorded in the Register of Declarations of Interest each year. This must include details of all orders received, invoices raised and the total value of the business undertaken.

Close Family of Members of Staff: When goods or services are to be purchased from a company in which a close family member of any member of staff has a personal interest then the purchase must be approved by the Head of College/department and the Director of Finance prior to the order being placed. If the close family member is related to the Head of College / Department then the Vice Chancellor's approval must be obtained prior to the order being placed. The member of staff must not have any involvement whatsoever in the tender process or the decision to award the contract.

Ex Members of staff: Before placing any orders or contracts with an ex member of staff the requirements must be subjected to a formal tender process. The University will not invite former members of staff to tender for business until a minimum period of six months has elapsed after they have left the employment of the University.

Value for money

Purchases must be based on the best value for money options considering the quality of the service, good or works proposed (the 'best price-quality ratio') or on the lowest price. For the best price-quality ratio, price is an essential aspect — together with quality criteria, such as technical quality, running costs, delivery times, after-sales service and technical assistance, etc. — but it is not automatically necessary to select the offer with the lowest price. The criteria defining 'quality' must be clear and in line with the proposed purpose of the purchase. Value for Money should include taking into consideration the whole life cost of the good/service and the costs of disposal. In order to ensure that "value for money" is obtained all Buyers must ensure that competition is sought and stimulated in accordance with the University's Financial Regulations and Procedures, UK Law and European Union Rules. Value for money isn't always about achieving the lowest price, it is about ensuring the specification is detailed enough that product/service fulfils all the requirements and that all aspects including after sales service/ delivery etc are considered to form part of the Value. In addition the University has adopted a Sustainable Procurement Policy order to comply with this policy, sustainability factors such as social, environmental and economic issues should be considered wherever appropriate.

Tendering

Tendering covers all intended purchases of an aggregated value of £24,999 or above and must comply with Swansea University's internal regulations and the relevant EC regulations. A minimum of three suppliers must be selected to be invited to tender. These suppliers must have the capacity and capability to carry out the specification set out in the tender document. In order to commence a tender process a tender registration number must be obtained from the Purchasing Department. The tender documentation will need to include:

1. Clear specification of requirement,
2. Form of tender,
3. Method of contact for queries by tenderers. Questions raised by any tenderer, and subsequent answers given during the process, should be forwarded to all tenderers to ensure consistency of information,
4. Date and procedure for return of tender bids,
5. University Terms & Conditions apply unless otherwise stated.

Dunn & Bradstreet reports on tenderer's financial position will be sought for all tenderers. Tenderers are to be instructed to return bids via Bravo Solutions to ensure that all submissions are transparent. Any bids not received by the specified time and date may be disqualified. Prior to evaluating the tenders the scoring matrix will have been published in the tender and all evaluators made aware of the criteria prior to the meeting. Scoring will be conducted independently; the outcome of the process and subsequent award is to be entered onto a tender report document. There are circumstances in which the requirement to seek competitive bids is inappropriate and an exemption to procedure can be applied. Applications for Exemptions must be made using a Purchase Order Approval form, authorised by the Head of College or the Deputy Head of College.

Examples of Exemptions are:

- Sole source of supply
- Work of a specialist nature
- Emergency requirements
- Procurement through a Public Sector framework agreement
- Procurement tendered by an external organisation on behalf of SOAS
- Proprietary goods or services
- Extended requirements based on matching specification.

Unless procurement is through an EU-compliant framework agreement, exemptions will not apply to contracts over EU thresholds. Unsuccessful and successful tenderers will be notified in writing and via the e-tendering portal. Written confirmation of acceptance of contract should be sought from the successful tenderer. All notification should be carried out in writing or via the e-tender portal. Feedback for unsuccessful tendered will be available in accordance with Alcatel rules.

Any contract award resulting from the tender process should be reviewed either at the completion of the task (if the task was a specific one off instruction or purchase), or after a maximum three month

period. Any review should be measuring if the specification of the contract is being met, and addressing any difficulties being experienced by either party. Both parties should be represented at such reviews and the meetings should have an agreed agenda and be minuted.

6.6.2 Cardiff University

Cardiff University's procurement procedures state that all purchases must be made on the basis of proven 'best value for money' for the 'whole life cost' of the required product or service. This must take into account the required levels of quality and performance, together with the purchase price, financing costs, running costs, maintenance costs and disposal costs as appropriate. Fair competition should be employed at all times. This is legislated for in EU Directives, but the same principles should apply to all purchases.

The following table summarises the procurement thresholds and detailed procurement procedures that will be followed by the ASTUTE 2020 Team at Cardiff University in line with WEFO requirements:

Value excl. VAT	**Procurement Process**	**Additional Information**
Less than £500	The budget holder shall have the discretion to decide whether or not to obtain quotations, but value for money must always be obtained.	Refer to UniBuy in the first instance for appropriate preferred suppliers.
From £500 to £4,999	The budget holder should normally obtain at least three written quotations to ensure competitiveness.	Refer to UniBuy in the first instance for appropriate preferred suppliers.
From £5,000 to £24,999	The budget holder shall be required to obtain at least three written quotations.	Refer to UniBuy in the first instance for appropriate preferred suppliers. For Procurement requirements greater than £25K, the Procurer must consider the benefits of placing a Contract Opportunity Publication (COP) on Sell2Wales to notify the supply market of the opportunity. The COP will be published by Procurement Services.
Over £25,000	All items will require at least three competitive sealed bid tenders.	Refer to UniBuy in the first instance for appropriate preferred suppliers. Contact Procurement Services for support with the tendering process, or for further advice. Procurement Services will manage and conduct all tenders and contract awards, unless agreed otherwise by the Head of Procurement. The Gateway review process will be followed.
Over £164,176 (Goods and Services)	All goods and services over this financial limit must be subject to an EU tender process.	Refer to UniBuy in the first instance for appropriate preferred suppliers. Contact Procurement Services for support

		with the tendering process, or for further advice. Procurement Services will manage and conduct all tenders and contract awards, unless agreed otherwise by the Head of Procurement. The Gateway review process will be followed.
Over £4,104,394 (Works)	All capital works over this financial limit must be subject to an EU tender process (e.g. building refurbishments, extensions and new builds).	Refer to UniBuy in the first instance for appropriate preferred suppliers. Contact Procurement Services for support with the tendering process, or for further advice. Procurement Services will Manage and conduct all tenders and contract awards, unless agreed otherwise by the Head of Procurement. The Gateway review process will be followed.

*All tendering exercises over £25k must be undertaken using the University's e-sourcing system, IN-Tend
** All contract opportunities above £25k must be advertised on Sell2Wales. Contact Procurement Services to arrange publication.
*** All contract opportunities above £164,176 must be advertised on Sell2Wales and a Contract Notice published in the OJEU. Contact Procurement Services to arrange publication.

Cardiff University requires its end users to check to see whether or not there are any framework agreements already in place that are capable of supplying the goods or services that are required. UniBuy is a HE database of contracts that are available to use which have already been through a formal procurement process. If the goods or services required are not available under an existing framework agreement then a tender process would be conducted. All requisitions over £10,000 (excluding VAT) must be routed through Cardiff University Procurement Services for countersigning by the Head of Procurement or nominee before forwarding to a supplier. This procedure applies even if the supplier is an official contractor. Also, exceptionally, if quotation or tendering procedures cannot be followed, either the Director of Finance or nominee will need to approve the proposed purchase.

6.6.3 Aberystwyth University

Aberystwyth University has no budget larger than £5,000 within its allocation for ASTUTE 2020. This greatly simplifies the rules which need to be applied to the budget.

1. The budget holder will get a written quotation for the purchase.

2. They will check that sufficient funds exist within the project and that the purchase is acceptable within the conditions of the budget.

3. Purchase will be made through purchase order (preferable) or personal credit card (departmental credit cards were ruled not acceptable for ASTUTE purchases on the previous project).

4. When goods have arrived, payment will be made against invoice from supplier, or against expense claim with supporting proof of payment, as appropriate.

In addition, in line with the results of the PIV carried out during ASTUTE, all Aberystwyth claims for travel and subsistence expenses will be marked with the time of departure on the journey

prompting the expense and the time of arrival back home.

Aberystwyth University complies with the Public Contract regulations 2015 as stated in our financial procedures:-

"…when EU Procurement Directives apply, any contract of supply to a publicly funded organisation for goods or services with a value greater than £172,514 (net of VAT) must be advertised in the Official Journal of the European Union (OJEU) and tenders must be sought. The same applies to contracts for works with a value greater than £4,322,012 (net of VAT)…."

Advertisement of procurement opportunities on sell2wales (to ensure compliance with the Welsh procurement Policy Statement and stimulate open competition) is contemplated on all contracts valued in excess of £25,000 (net of VAT). All contracts in excess of £5,000 (net of VAT) are contemplated to be awarded via a competitive quotation process.

6.6.4 UWTSD

UWTSD will comply with the ERDF procurement Guidelines. There is no procurement in UWTSD's budget over £5,000 and UWTSD's regulations will be followed for items less than £5,000.

The relevant section in UWTSD's financial regulations is:

10.4.6: Purchases of Equipment and Services - Quotations

a. For orders below £2,000 no quotes are necessary. For orders between £2,000 and £5,000 - three quotes should be obtained by telephone or letter, and a simple record maintained of the transaction for audit purposes. This would not be required for purchases below £5,000 from consortium sources. If three quotes cannot be obtained a memo attached to the order must be approved by the Director of Finance.

b. No series of £2,000 orders should be made as a means of obtaining a higher value order without the need for three quotes.

6.7 Risks

6.7.1 University management of risk

ASTUTE 2020 will fully comply with Swansea University's Risk Management Policy. Risk management practices including this policy are available on the University website: www.swansea.ac.uk/pspu/riskmanagement.

6.7.2 Risk register and contingency planning

The operation will have a detailed risk register to identify risks, which will also allow ASTUTE 2020 to detail the controls to manage the risk as well as identify its owner. The current version of the Risk Register is presented in Appendix VII. It will be reviewed and updated regularly.

As part of the risk management process it will be advisable to put contingency plans in place for

high impact/highly likely risks for the operation. This contingency planning will involve identifying a strategy and an owner should the risk be realised. These contingency plans will be discussed at senior management level and should form part of the strategic management of the operation.

6.8 Management and IT Systems

With a large multi partner Operation such ASTUTE 2020 it is essential to have a central point for storage of all data related to the operation. ASTUTE 2020 has got its own server at Swansea University that only the ASTUTE 2020 team has got access to and that is being backed up regularly. The Coordination and Support Team has set up detailed logs and filing systems on this server to keep track of all enterprise interactions and deliverables. It is also the intention to use a newly installed CRM system at Swansea University for recording key correspondence with companies across the partnership and we will investigate the possibility of storing all operation related forms on this system.

6.9 Draft Closure Plans

The operation close down process will commence approximately 12 months before the scheduled end date and will be directed by the Operation Manager. In the final few months of the operation there will be a gradual ramp down in the activity first by the smaller partners, then by Cardiff University and finally by Swansea so that all results can be collated and stored in a format suitable for archiving. We will consult with WEFO on this issue in a timely manner.

6.10 Compliance with Relevant Legislation

ASTUTE 2020 will not involve construction of new buildings so we do not need to consider such issues as planning regulations, Natura sites and habitats directives in the same way that some other ERDF projects do. There will of course be a need to comply with equality and environmental legislation, and all the partner HEIs have policies in place to cover these. The most critical legislation to take into consideration will be that for State Aid, and the treatment of this in ASTUTE 2020 is dealt with in the Chapter on '*Financial and Compliance'*.

7 Financial & Compliance

7.1 Historical Background

ASTUTE is a partnership of all Welsh Universities which was formed on 1st May 2010 and has been successfully operating since then with the purpose of delivering the Advanced Sustainable Manufacturing Technologies project until 30 June 2015. It is not registered as a business or charitable body, and as such is not a legal entity. The HEI partnership consisting of Swansea University, Cardiff University, Aberystwyth University and the University of Wales Trinity Saint David (UWTSD) proposes this follow on operation 'ASTUTE 2020'.

7.2 Conflicts of Interest

At this stage, we are not aware of any conflicts of interest in terms of the people who will manage the proposed ASTUTE 2020 operation. Furthermore, the Universities have in place detailed procedures to monitor and manage potential conflicts of interest that might arise as the operation proceeds. Conflicts of Interest management for industrial RD&I collaborations will be part of the Project Approval process in ASTUTE 2020. More details are provided in the chapter on '*Management of the Operation'*.

Swansea University's Conflict of Interest Policy is managed by the Director of the Department of Research and Innovation. The Director has primary responsibility for the management of conflicts in research activity. All Staff Members must complete the "Declaration of Outside Interests by Staff" (as it may be varied from time to time) annually and at such other times during the course of the year when necessary to reflect a significant change in a Staff Member's circumstances. A register of interests is compiled by the Registrar, and is available for inspection on request.

Cardiff University operates a Register of Interests for members of University Council and all Heads of Schools and Senior Staff. Declarations made by members for 2014-15 are publically available on line at: http://www.cardiff.ac.uk/govrn/governance/index.html. University Council Member, Mrs Glenys Williams, is married to Sir Peter Williams, who is a member of the Welsh Government Economy, Science and Transport Advisory Board, and the Bevan Commission (as taken from the Register of Interests). Neither have any direct involvement in the development of this proposal. Professor Ole Petersen, Head of Cardiff University School of Biosciences, is a Member of Welsh Government Science Advisory Council for Wales and Delivery Board for the Ser Cymru Programme (as taken from the Register of Interests). He has not had any direct involvement with the development of this proposal.

No conflicts of interest for Aberystwyth University have been identified in relation to the ASTUTE 2020 proposal. The Management of Conflict of Interest in the Workplace is located in HR. A declaration of Outside Interests by Staff is compiled and robust policies and procedures are in place to oversee the implementation of these.

The University of Wales Trinity Saint David is in the process of updating its Register of Interests list due to its recent merger. All staff are required to declare any outside interests that might conflict

with their employment at UWTSD and will be required to complete a form on a regular basis. We are not aware of any conflict of interest regarding the proposed ASTUTE 2020 bid.

7.3 County Court Judgements

We are not aware of any County Court Judgements relating to Swansea or Cardiff University as an organisation. No information is collated on individuals working for Swansea or Cardiff University. Information on other potential beneficiaries to follow once the partnership has been defined. There are no previous County Court Judgements relating to any individual and/or organisation or business related to this proposal from Aberystwyth University. In addition there are no associated dissolved companies. At the time of writing we are not aware of any County Court Judgements relating to University of Wales Trinity Saint David. No information is collated on individuals working for UWTSD.

7.4 Outline Costs for Operation Phases

The proposed operation is planned to run from 1 July 2015 to 30 June 2020, with a total budget of approximately £14.7 million for delivery of the core engineering activity in WWV, and the initial funding underwritten by the partner universities with the expectation of retrospection. It is anticipated that there will be three phases of operation as outlined in Figure 7.1. A detailed Operation Plan is provided in the Appendix and an Operation Cost Breakdown is presented in the section on *'Value for Money'*. Further milestones are in the process of being agreed with WEFO and will be added as a separate Appendix XVIII.

	2015	2016		2017		2018		2019		2020
	Q1/Q2	Q3/Q4	Q5/Q6	Q7/Q8	Q9/Q10	Q11/Q12	Q13/Q14	Q15/Q16	Q17/Q18	Q19/Q20
Continuity and Mobilisation										
Operation staff recruitment										
Initial Procurement of Goods and Services										
Partnership Collaboration agreement										
Out of area spend notification										
Monitoring and Evaluation plan draft										
Annual report format and submission										
Finalise operational procedures										
Stakeholder engagement										
Establish national and international network										
Industrial engagement										
Development and Initial Delivery										
Industrial engagement										
Horizon Scanning activities										
Launch event (format to be confirmed)										
Technology Awareness events										
Stakeholder engagement										
Establish national and international network										
Inception evaluation report finalised										
Mid term evaluation report finalised										
Gateway assessment and Re-profile sign off										
Delivery and Exit Strategy										
Industrial engagement										
Horizon Scanning activities										
Stakeholder engagement										
Technology Awareness events										
Final evaluation report finalised										
Establish national and international network										
Secure funding for follow-on operation										
Project closure										

Figure 7.1 ASTUTE 2020 operation plan

7.4.1 The Continuity and Mobilisation Phase

This phase is planned to last six to nine months. The key activities (displayed in yellow) will be staff recruitment in cases where it has not yet been completed pre ASTUTE 2020, finalising ASTUTE 2020's operational procedures, development of project proposals from the project pipeline and RD&I collaboration delivery (Industrial engagement) and Stakeholder engagement to further define synergistic activities. While the academics will steer the RD&I collaborations by providing their world-class expertise, the highly qualified Project Officers are key for delivering the actual technical work in collaboration with the companies. Their specialisms will be selected in line with the operation's Adaptive Smart Specialisations as outlined in the previous sections. The core partners Swansea and Cardiff have both tried to ensure continuity by starting the recruitment process while the ASTUTE team has still been in place and it is therefore expected that the majority of the ASTUTE 2020 team will be recruited and formally appointed early in the mobilisation phase. Considerable demand from industry has resulted in a pipeline of RD&I project ideas that are ready to be developed into project proposals at the start of the ASTUTE 2020 operation. We will endeavour for early, pragmatic approval of these smaller projects to ensure generation early impact of ASTUTE 2020 with already employed staff.

It is only once the full teams in Swansea and Cardiff are appointed and the project approval process is fully functioning as evidenced by the approval of a significant number of projects that we can consider the first phase to be complete. The smaller partners Aberystwyth University and UWTSD will be part of this mobilisation phase through participation in management and governance but their technical contribution is anticipated to start in 2016.

Key milestones for the mobilisation phase (displayed in orange in detailed Profile in the Appendix) include finalised appointment of the full teams in Swansea and Cardiff as well as operational procedures being in place, signature of the Partnership Collaboration Agreement, Submission of a draft Monitoring and Evaluation Plan to WEFO, and agreement on the annual reports and the notification of Out of Area Spend with WEFO.

7.4.2 The Development and Initial Delivery Phase

The second phase will commence once the full operation team and procedures are in place. Key activities in this phase are increasing industrial engagement mainly in form of collaborative RD&I projects, stakeholder engagement, Technology Awareness events, and establishing of a national and international network by building on existing links. Milestones are a launch event, the inception evaluation report as well as the mid-term evaluation report and a horizon-scanning workshop. The key milestone is a gateway in 2018 where we will re-assess our Adaptive Smart Specialisations, industry demand, operation performance and procedures through a process informed by the mid-term evaluation and a horizon-scanning workshop with input from Industry Wales' sector mapping exercise; this gateway assessment will help shape the next phase. We envisage a re-profile at the end of this phase.

7.4.3 The Delivery and Exit Strategy Phase

The second phase will commence once the full operation team and procedures are in place. We expect further recruitment activities due to staff departure incurred in the mobilisation phase and

later on. Key activities in this phase are increasing industrial engagement mainly in form of collaborative RD&I projects, stakeholder engagement, Technology Awareness events, and establishing of a national and international network by building on existing links. Milestones are a launch event, the inception evaluation report as well as the mid-term evaluation report and a horizon-scanning workshop. The key milestone is a gateway in 2018 where we will assess our actual achievements vs predicted achievements, and where we will re-assess our Adaptive Smart Specialisations, industry demand, operation performance and procedures through a process informed by the mid-term evaluation and a horizon-scanning workshop with input from Industry Wales' sector mapping exercise; this gateway assessment will help shape the next phase. We envisage a re-profile at the end of this phase.

Table 7.1 Anticipated ASTUTE 2020 Outline Costs

	Continuity and Mobilisation	Development and Initial Delivery	Delivery and Exit Strategy	Total
	6	30	24	60
Total Operation value	£1,167,642	£8,975,519	£4,516,532	**£14,659,693**
Match Funding	£303,120	£2,888,159	£1,452,121	**£4,643,400**
Funding Gap	**£864,522**	**£6,087,360**	**£3,064,411**	**£10,016,293**

7.5 Simplified Cost Options

In line with the 'Eligibility Rules and Conditions for support from the European Structural Funds ERDF 2014-2020' (page 59), indirect costs have been calculated as a 25% flat rate of the total applicable direct costs excluding costs of sub-contracting (contracted delivery of operations, projects or discrete activities) which form the category 'External services and experts' (see section 7.8.1). We do not expect any expenditure for 'resources made available by third parties which are not used on the beneficiary's premises' or 'financial support to third parties'.

7.6 State Aid Status of Beneficiaries

Swansea University as lead beneficiary and its HEI partners as joint beneficiaries will use the ERDF funds to deliver world-class expertise through knowledge development, exchange and technology and know-how transfer to the Welsh manufacturing industry. Under the new RD&I framework, the Universities are regarded as research organisations and the proposed activities involve the sharing of University research and experience in cutting edge manufacturing techniques which qualifies as Knowledge Transfer activity. This is considered non-economic and as such the public funding towards it will not qualify as State Aid. Further details on State Aid considerations can be found below and in the State Aid approach and draft letter from DWF LLP in Appendix XII.

7.7 Net Revenue Generation and Financial Instruments

In accordance with the 'Eligibility Rules and Conditions for support from the European Structural Funds 2014-2020', ASTUTE 2020 is classified as 'Revenue Generating Project'; the funding is provided to the universities on a 'no aid' basis in line with the R&D&I State Aid Framework and is therefore not subject to State Aid rules in terms of income generation. We do not expect to generate significant income throughout the duration of the operation. Rule B of the Eligibility Rules applies and WEFO will be informed of any net revenue generation during operation implementation and for up to three years afterwards as soon as possible. Income could be generated through Contract RD&I as described in Appendix XII. We expect this activity to amount to considerably less than 20 % of ASTUTE 2020's overall activity and any income will be re-invested into the operation's primary activities. All Contract RD&I activity will be closely monitored and all revenues generated will be paid into a separate ring-fenced account (see Appendix XII for more details). In accordance with the guidelines we will submit an annual declaration when requested by WEFO. The annual declaration will detail the revenues earned as well as the costs incurred in earning these revenues or will be a nil return when no revenue has been generated. Only operating costs that are directly associated with generating the corresponding revenue will be included in the annual declaration on a cash basis. The annual declaration will be signed off by the Head of Finance in the College of Engineering and will be audited. Costs for these audits have been profiled in the budget (see section 7.8.1, Professional Services). ASTUTE 2020 will not be operating any financial instruments.

7.8 The Funding Package

The indicative overall value of the proposed ASTUTE 2020 operation is approx. £14.7m, whereby approx. 32% are met by match funding from the beneficiaries and we are requesting that the remaining 68% be met from ERDF structural funding. An overview can be found in section 8.3.

7.8.1 Shared Costs for Coordination, Support and Management

Of the £14.7m overall budget, approximately 12% will be shared costs for overall administration, central support activities (e.g. marketing, horizon scanning exercises) and coordination of the operation that will be carried out through Swansea University as the lead beneficiary. Approximately 88% will be split between all partners (including Swansea) for delivery of the core engineering activity including a small part for related administration.

The estimated budget for the 'Coordination & Support Team' will consist of the following categories:

(i) Human Resources (£7k): £1k have been allocated for recruitment to the CST and £6k for redundancy payments as we are expecting a smaller, part-funded follow-on operation starting in 2020; details will be provided in the '*Long term Sustainability*' section. All redundancy payments will be in line with the University's statutory requirements and the Eligibility Rules for this programme.

(ii)ICT (£13.3k):

Hardware Purchase (£10.3k): A small budget of £10.3k has been allocated for ICT hardware,

broken down as follows: five computers as replacement for old machines at the end of year 3. Computers bought in the previous ASTUTE will be used wherever possible. Five of the six machines used by the six members of the CST will be more than 6 years old by the end of 2018 and will need to be replaced to cope with new software update requirements. Costs have been estimated at £7500 for five desktops. For environmental sustainability ASTUTE 2020 will aim to operate as paperless as possible and the CST members will be provided with tablet computers to avoid unnecessary printing and thus save on paper and printer cartridges. Costs have been estimated at £2800 for four tablet computers, one for each of the three full time members of the CST and one to be shared between the Targets- and the Legal Coordinator. All procurement for the CST will be in line with Swansea University's 'Expenses and Benefits' and 'Sustainable Procurement' policies whose objectives amongst others are:

1. To obtain maximum value for money from expenditure on travel, subsistence and hospitality;

2. To ensure such expenditure represents the necessary and reasonable costs incurred by or on behalf of University employees who are properly engaged on University business;

3. To minimise the cost of administering the expenditure, particularly the indirect cost represented by the time spent by employees making travel arrangements and submitting claims for reimbursement of expenses.

Software Purchase (£3k): Costs for software licenses for e.g. Adobe packages and video editing software for company testimonials are estimated at £3k based on current software prices. These types of software are not available as standard packages in the University but educational discounts will be applied to the purchase where possible.

(iii) Professional Service (£155,500):

Evaluation, development and monitoring (£111,500):

These consist of professional services and external expertise required for development and monitoring of the operation such as:

- Legal fees required for State Aid support before (£5.5k) and during implementation of the operation (£20k); the budget for State Aid advice is higher than in the last project to ensure that external advice on compliance will be available throughout the operation,

- Evaluation fees for the inception, mid-term and final evaluation (£55k); values are lower than in the last ASTUTE due to the focus and concentration and smaller number of partners in ASTUTE 2020,

- Fees for other activities relevant for delivery of the operation such as two Horizon Scanning workshops (£31k, £15.5k per workshop). We are expecting two of these workshops over the duration of the operation as outlined in the Operation Plan in the Appendix. We are looking to procure an external facilitator to deliver these workshops at approx. £3k per event. As

participants we are expecting to invite two external industrial consultants at a daily rate of approx. £2k plus travel and subsistence for three days per workshop including preparation time (£12k total per workshop) as well as the SAB members. Travel costs for the invited stakeholders and catering are expected to amount to £500 per workshop.

All external facilitators and consultants will be procured in line with the regulations as outlined in section 6.6.

Accountancy and Audit fees (£4k): Fees for the external financial audit in terms of net revenue generation (see section 7.7). We are expecting £100 per partner per year for 10 years.

Consultancy fees (£40k):

IP Due Diligence (£40k): Following further discussions with the WG SMART Operations and within the Project Committee (including Industry Wales) we are looking to engage a private sector consultancy to provide IP due diligence for our high value industrial projects in order to assess the feasibility of the project in terms of existing IP and impact through technology transfer potential. This will determine whether investing public resources into a project will result in new and innovative products and processes or whether the project should not go ahead because there is already existing IP. This will also provide the opportunity to assess the potential for technology transfer opportunities and for opening up new markets for the project results. This will follow approved SMART CYMRU procedures.

The WG Innovation Specialists facilitate an IP audit for their client companies. This inward looking IP audit can provide an indication for the innovation potential of a company by looking at business processes in terms of IP. ASTUTE 2020 is looking to work with the Innovation Specialists and signpost interested companies to this service. IP due diligence is an entirely different assessment which is outward looking and involves a patent search in order to determine whether the proposed project will involve innovative steps and create new IP. SMARTCymru carry out this assessment for projects from £5k project value onwards through a framework agreement with a subcontractor. We have discussed whether ASTUTE 2020 could use the same framework agreement and be invoiced by WG but this would not be acceptable from a procurement point of view. We are therefore looking to subcontract this to a procured external consultant at an estimated value of £800-£1000 per project. We expect that the consultant will have to provide advice on approx. 40 projects over ASTUTE 2020's lifetime, bearing in mind that the majority of our projects will be above £10k HEI input and that some of them will not progress to project stage because the IP search indicates that there is not enough novelty in the potential outcomes. This service will have to be provided by the appropriate subcontractor who will also be expected to provide an analysis of new opportunities for exploitation of the generated IP in order to maximise economic impact as highlighted in the IP feasibility study carried out under the previous ASTUTE.

(iv) Travel & Transport (£30,940):

Travel & Subsistence (£28,940):

These include costs for transportation, accommodation and subsistence for the management and

implementation of the operation:

National travel (£25,340)

Based on experience in the last ASTUTE we are expecting the following number of visits to partners and stakeholders each quarter:

Costs are estimated on the basis of three members of the CS team sharing a car to combine visits and reduce individual travel as much as possible (Swansea University estimates that for journeys over 120 miles, car hire and petrol cost can be cheaper than reimbursing the current approved mileage rates and therefore encourages staff to use hired cars instead of personal vehicles where possible and has arranged a contract with a local supplier on preferential terms):

- Four half day visits at £101 each on average: £50 car hire, £30 fuel, 3x£7 subsistence,
- Five one day visits at £119 each on average: £50 car hire, £30 fuel, 3x£13 subsistence,
- For one person: One overnight visit at £268 on average: £100 car hire, £45 fuel, £38 subsistence, £85 accommodation

Based on the above, costs for national travel are estimated at an average of £1267 per quarter.

International travel (£3,600)

We also envisage a small budget for international travel to take part in relevant international workshops for liaison with leading foreign experts in areas relevant to the areas of Adaptive Smart Specialisation in order to work with and learn from them and bring the extended knowledge back into WWV. We have started building connections with the Vanguard initiative and the ERRIN network through WHEB and are looking to further exploit these connections for the benefit of enterprises in WWV by liaising with experts in areas relevant to the areas of Adaptive Smart Specialisation for future collaboration and knowledge transfer into companies in WWV. We are anticipating one international European journey per year for the Operation Director or Operation Manager to relevant Vanguard, ERRIN or similar meetings. Costs depend on the destination as these workshops are being hosted by different Member States and are estimated on average at £720 per journey (£3.6k for one journey per year over five years). The £720 can only be an estimate based on the SU rates for overseas travel as different rates will apply for different EU countries and the EUR exchange rate will change over the course of the operation. As an estimate, the journey will cost £420 including travel to and from the airport or train station and from the hotel to the event venue. Hotel costs have been estimated at £140 for one night plus subsistence for two days at £160. Value for money will be sought for all bookings and the values above are considered to be maximum estimates.

Other Travel (£2,000)

As outlined below, we envisage five full day events over the duration of the operation to bring together the ASTUTE 2020 team, other academics, industrialists, and policy makers. We expect to hold these events in South Mid/West Wales to reduce travel for the majority of companies that we expect to work with and for the two bigger partners. Costs for the partners to travel to these events will come from the CST budget instead of the partners' individual budgets and

costs are estimated at £400 pa.

(v)Marketing & Promotion (£50,420):

Advertising & Promotion (£20,800): This category includes costs for externally designing and hosting the ASTUTE 2020 website and other digital marketing avenues, PR and advertising in relevant newspapers and magazines, membership in forums relevant to Welsh manufacturing

Events (£23,320): We envisage holding one full day event per year at an external location for industry, policy makers and the ASTUTE 2020 team plus one launch event at the beginning of the operation. Costs have been estimated based on rates for local venues: full day room hire £500 plus catering for 150 attendees @ £3300 (=£3800 per event). In addition, we are looking to hold a number of shorter , half-day Technology Awareness events estimated at approx. £500 each with room hire (£250) and catering for approx. 35 attendees as well as an Information day with WG SMARTInnovation, SMARTExpertise and SMARTCymru in October 2015. This information day was held for ASTUTE 2020 and WG SMART operations team members for reciprocal information about the respective operations to enable intelligent signposting and referrals as well as to highlight lessons learned from the last few years that will be used to set up a robust referral process. 38 team members from both ASTUTE 2020 and the WG operations attended this event that was held at an external venue because there was no large enough meeting room available at Swansea University at a mutually convenient date; costs were approx. £1000. Also included in this category are costs for ASTUTE 2020 management meetings which will preferably be held in the partner institutions to avoid costs for room hire. In order to save travel time for the industrial stakeholders it might occasionally be necessary to hire an external location. Catering costs have been estimated based on average rates from local caterers.

Printing, Production & Reprographics (£6,300): This category includes costs for externally printed PR material like banners, business cards, posters and case study cards as well as for approved translation of marketing material into Welsh. Our emphasis will be on digital materials rather than printed matter for sustainability reasons and value for money, hence this budget category is small compared to the last ASTUTE.

(vi) Staff – Project Management (£1,187382):

These consist of salaries for 4.8FTE as detailed in Table 7.2. Experience in the last ASTUTE and findings presented in the Final Evaluation report for ASTUTE have shown that a strong central administration team with clearly defined and separated roles is essential for the successful delivery of the project. The roles in the last ASTUTE project have been revisited, condensed but adapted to the growing administrative requirements and new WEFO procedures. Details about the individual roles are outlined in the '*Delivery*' chapter and job descriptions are included in the Appendix. A small proportion of the budget will be used to employ a part-time person in Swansea University's Department of Research, Engagement & Innovation Services (REIS) to support the claims process and in the College of Engineering Finance department to provide financial advice.

Table 7.2 Overview of Coordination and Support Team

Job Title	FTE	Contract Length	Grade & Pt (at appointment)	Current Total Annual Employment Costs @ 1.7.15	Total ASTUTE 2020 Costs
Operation Director	0.20	5 Years	[ ]	[ ]	[ ]
Operations Manager	1.00	5 Years	10[ ]	£58,921 - £72,628	[ ]
Targets & Procurement Coordinator	0.70	5 Years	8[ ]	£42,369 - £49,260 pro rata	[ ]
Legal & Contracts Coordinator	0.60	5 Years	8[ ]	£42,369 - £49,260 pro rata	[ ]
Communications and Admin Officer	1.00	5 Years	7[ ]	£34,318 - £41,116	[ ]
Finance Coordinator	1.00	5 Years	8 [ ]	£ 42,369 - £49,260	[ ]
REIS	0.25	4.25 Years	6 [ ]	£ 31,671 - £39112 pro rata	[ ]
Eng Finance	0.10	5 Years	10 [ ]	£64,450 - £72,628 pro rata	[ ]
Total FTE 4.85					**£1,187,382**

[Information Redacted in table 7.2 above – section 40 (2)]

A table outlining Swansea University's salary grades can be found in Appendix XIII.

(vii) Administration – Consumables (£18,000):

these include administrative expenses that support the delivery of the operation e.g. stationery, small IT items such as USB drives, personal health and safety items such as ergonomic keyboard rests, mobile phone charges for key staff, stationery, small IT items such as USB drives, personal health and safety items such as ergonomic keyboard rests etc. as well as costs for closure and archiving. These are estimated at £900 per quarter (=£200 per 4.5 FTE) based on experience in the last ASTUTE; consumables for the REIS and Engineering Finance support are not included in this budget.

7.8.2 Resources required for Technical Delivery

Costs for the Technical Delivery of ASTUTE 2020 have been estimated in a bottom-up approach based on the envisaged number of industrial RD&I collaborations.

7.8.3 Operation – Resource Profile

An operation – resource profile has been compiled giving an 'average' view of resource requirement for the types of projects we would typically be running as part of ASTUTE 2020. The previous ASTUTE has engaged with industry through more than 150 R&D collaborations with the majority being below 12 months. With ASTUTE 2020 being more focused, we are looking to run

fewer collaborations overall but a proportionally higher number of longer and more strategic projects. The number of smaller projects will be comparatively lower but we are still expecting a few short term projects, particularly with companies that we have not worked with before. Experience in the previous ASTUTE has shown that some short projects can often lead to high impact in terms of 'improved processes' and 'jobs created'. An indicative breakdown of anticipated project durations is given in Table 7.3.

Table 7.3 Indicative ASTUTE 2020 resource profile

Indicative RD&I collaboration duration	Anticipated number of collaborations	Indicative person hours required per collaboration	Indicative person hours required for all collaborations
3 months	4	745	2980
6 months	8	1500	12000
1 year	6	3200	19200
2 years	10	7200	72000
3 years	12	9710	116520

This profile gives an overview of the indicative required person hours for the RD&I collaborations. Overall and based on our extensive experience from ASTUTE, we estimate that we will require approx. 222,700 person hours of technical expertise partly from project officers and partly from academics and specialist technicians for 40 collaborative RD&I projects to achieve the anticipated economic impact. This figure gives the basis for the technical budget estimates outlined below. During the operation of ASTUTE 2020 we expect our partners to propose specific collaborative RD&I projects which are well formed in terms of the industrial partner requirements, the technology challenges to be addressed, the proposed technology development and knowledge transfer programme, together with the specific human resources required to deliver it and the expected benefits in terms of operation outputs and strategic impact on the manufacturing sector in WWV. Before any such a project commences it will have to be approved by the Project Committee (PC) who will be responsible for its assessment with regard to all these aspects and subsequent approval. An outline of the criteria for the project approval process is given in the section on '*Management of Operation*' and the detailed process is described in the Appendix.

7.8.4 Swansea University Technical Delivery - Costs for Core Engineering activity

Drawing extensively on the experience with the previous ASTUTE project, the budget for the Swansea University Technical Delivery consists of the categories below:

All procurement for the Swansea Technical team will be in line with Swansea University's 'Expenses and Benefits' and 'Sustainable Procurement' policies whose objectives amongst others are to:

1. To obtain maximum value for money from expenditure on travel, subsistence and hospitality;

2. To ensure such expenditure represents the necessary and reasonable costs incurred by or on behalf of University employees who are properly engaged on University business;

3. To minimise the cost of administering the expenditure, particularly the indirect cost represented by the time spent by employees making travel arrangements and submitting claims for reimbursement of expenses.

(i) Accommodation: Furniture & Equipment (£622,759.60):

Some state of the art equipment will have to be purchased for use in RD&I projects for direct support of the Adaptive Smart Specialisations. Experience in the last ASTUTE project with the Additive Layer Manufacturing (ALM) machine has shown the benefit of world-class expertise combined with state of the art equipment in terms of industry support. Descriptions for the different items are included in Appendix XIII.

(ii) Administration – Consumables (£280,191.34):

There will be a range of laboratory and office consumables that will be necessary to support the delivery of the operation. These will include chemicals, materials for additive layer manufacturing, machine service contracts, stationery, small IT items such as USB drives, personal health and safety items (ergonomic keyboard rests, safety clothing etc.),. This will average around £2,736 per FTE per year.

(iii) Estates - Renovation (£45,000):

There will be a small budget allocation for adapting the facilities on the Bay Campus. One of the main costs will be associated with installation of the ALM machine and related equipment such as the Hot Isostatic Press etc. The estimated cost of these modifications is £20k. There will also be further adaptation costs for other equipment, such as provision of three phase power supplies (e.g. we have been advised by the Swansea University Estates department that costs for installation of suitable electrical supplies are around £3k to £4k per unit.), compressed air, water suppliers and vented gas cylinder cabinets. We estimate this will bring the total for "Estates: Renovation" to £45k.

(iv) Human Resources: £5k have been allocated for recruitment to the SU TD team and £15k for redundancy payments as we are expecting a smaller, part-funded follow-on operation starting in 2020; details will be provided in the '*Long term Sustainability*' section. All redundancy payments will be in line with the University's statutory requirements and the Eligibility Rules for this programme.

(v) ICT:

Software Purchase (£150,500): There will be a significant cost associated with purchases and licence fees for a range of state of the art software. This will enable work mainly under the

Computational Engineering Modelling Adaptive Smart Specialisation, and will include advanced finite element method packages that can be used to model a range of physical phenomena corresponding to manufacturing processes. Software will average around £1,466 per FTE per year.

While there are some existing software licenses within the College of Engineering, it will not be feasible to utilise these, as the nature of the licence agreements restrict the use to teaching only or teaching plus fundamental research, which precludes use for collaboration with commercial companies. It will thus be necessary for ASTUTE 2020 to purchase software licences for the specific purpose of working with companies on research projects.

Hardware Purchase (£425,000): Some ICT hardware to replace dysfunctional items for project officers, tablet computers for 'going paperless' in line with the College of Engineering requirements and a development computing cluster platform for the support of *Computational Engineering Modelling* will also be required (£350k in total). There are no other facilities available within Swansea University for this activity. The Computational Foundry and HPCW 2 teams have confirmed that their facilities have got different requirements and tools compared to ASTUTE 2020 and will be used to full capacity for research under Specific Objective 1.1.

Within the £350k have included a small amount (around £9k) for portable tablet computers for some of the staff who will be involved in either (a) visits to companies (where high quality presentations will be required) or (b) working in laboratories (where new College of Engineering procedures require the use of 'paperless' notetaking).

As outlined in section 7.8.8 we are expecting ICT hardware contributions from Swansea University as match funding up to a value of £75k. We are also potentially envisaging industry donations as hardware match funding.

(vi) Travel & Transport (£50,040.50): this category includes costs for transportation, accommodation and subsistence for company visits.

Domestic Travel (£35,216):

Visits to Companies – two people on average sharing car

- Half Day visit to stakeholders and joint beneficiaries = £94 average (£50 car hire, £30 fuel, £14 subsistence, Swansea University encourages staff to use hired cars instead of personal vehicles where possible and has arranged a contract with a local supplier on preferential terms). Hence £ 47 (actually £47.04) per person.

- All Day visits to stakeholders and joint beneficiaries = £106 average (£50 car hire, £30 fuel, £26 subsistence) Hence £ 53 (actually £53.20) per person.

- If Every FTE makes on average 3 half day visits and 5 full day visits per year, it comes to about £407 per FTE per year. For average of 17.3 FTEs over 5 years this approximates to £35,216.

International Travel (£14,824.50):

We also envisage a small budget (approximately £15k) for international travel. The purpose of attending these world-leading conferences in ASTUTE 2020's areas of Adaptive Smart Specialisation will be to liaise and exchange knowledge with world-leading experts for the benefit of WWV.

International conferences costs on average

registration fee £ 200

flight £ 300

transfer £ 100

hotel £ 200

subsistence £ 188.30

Total = £988.30 on average

So for Swansea TD, Average 17.3 FTE over 5 years.

We anticipate that nearly all of these will attend one conference, so say 15 conferences = £14,824.50 in total

(vii) Staff costs (£5,077,585.56):

Project Delivery Staff (£3,983,979.40): these costs consist of salaries for the Strategic Technology Manager, Senior Project Officers, Project Officers and Junior Project Officers who will deliver the technical projects with companies, as well as IT/ Laboratory Technician support. A match funding contribution for project delivery of £87,018.75 from specialist technical staff is included within this category. The remaining £3,896,960.65 can be broken down by salary band as in the following Table 7.4.

Grade	Current Total Annual Employment Costs	ASTUTE 2020 Person Hours	ASTUTE 2020 FTE years	ASTUTE 2020 Costs
9	£ 48,243 to £ 63,166		20.17	
8	£ 40,285 to £ 49,742		27.41	
7	£ 34,652 to £ 41,516		28.60	
6	£ 32,464 to £ 40,089		5.00	
	TOTAL	**125587.96**	**81.18**	**£ 3,896,960.65**

[Information Redacted in table 7.4 above – section 40 (2)]

In deriving the table above, allowances have been included for inflation, automatic salary increments along spine points and re-grading of staff when appropriate, in line with Swansea University HR policies. A table outlining Swansea University's salary grades can be found in Appendix XV. The staff profile over time that is presented assumes continuous employment, and it is anticipated that (a) employment contracts might need to be extended, or (b) additional

personnel might need to be employed to make up for any lost person hours and for ASTUTE 2020 to be able to deliver the agreed indicators.

Grade 9 staff cover the Strategic Technology Manager and 3 or 4 Technical Managers (Senior Project Officers) who will have responsibility for managing the company collaborations on a day to day basis.

Grade 8 staff are the Project Officers who will be experienced researchers qualified to at least doctoral level. There will also be a number of "Junior Project Officers" who have slightly less experience than the Grade 8 staff and will thus be placed on Grade 7 in accordance with accepted practice at Swansea University. Technicians will be on Grade 6.

Thus the salaries for the Project Delivery staff at Swansea do vary considerably as there will be a wide spread of experience levels and varying responsibilities with the different roles.

The total employment costs include the on costs of employer's national insurance costs and the employer's contributions to the pension scheme.

An average breakdown of FTEs per year is included in section 6.5.1.

Project Management (£204,877.39): these consist of salaries for the administrators for the SU TD team that support evidence collection and administration for SU TD only. Tasks will include: taking minutes of meetings, collecting and verifying evidence for company contributions to collaborative projects, processing University staff timesheets (academics and project officers) and maintaining running totals of resources spent by ASTUTE 2020 on each individual project. It is anticipated that this will be approximately equivalent to one FTE at grade 6/7 over the full five years of the Operation. The role may be divided into two part-time positions.

Academics (£888,728.77): The estimated contribution by academic staff (match funding) is based on approx. 19,750 hours from academics (Professors, Readers and Lecturers within the three Adaptive Smart Specialisations).

7.8.5 Cardiff University - Costs for Core Engineering activity

All budget categories apart from staff costs are estimated on the base of the actual spend in the last ASTUTE, taking into account the smaller team size and price increases for goods and services. The budget for the Cardiff University Technical Delivery consists of the following categories:

(i) Administration – Consumables (£36,428): these include administrative expenses that support the delivery of the operation like e.g. laboratory and office consumables, mobile phone charges for key staff, stationery, small IT items such as USB drives, personal health and safety items such as ergonomic keyboard rests, safety clothing etc., dry wipe boards and marker pens, etc. Costs have been estimated as follows:

Admin consumables (£250 per FTE per Qtr) = £8,250

Technical and Academic Consumables = £28,178

(ii) ICT (£52,000):

Software Purchase (£36,000): These include costs for software licenses that are required for the RD&I projects including a range of specialist engineering software packages. Much of the research undertaken requires access to specialist software. Some required software is routinely provided by the University but many are Education Licences only. In this case if ASTUTE 2020 is to be able to use this software for working with companies, a commercial licence must be obtained. Use of the Education Licence for industrial or commercial use would be a breach of the software licence which would not comply with University requirements.

A range of software have been routinely used on the ASTUTE project and it is envisaged that similar software driven research will be required by manufacturing companies in ASTUTE 2020. The expected demands for the three Adaptive Smart Specialisations of Computational Engineering Modelling, Advanced Materials Technology and Manufacturing Systems Engineering will require:

- Computer Aided Design (CAD) Package
- Finite Element Analysis (FEA) Package
- Multi Physic Computational Analysis
- Discrete Event Simulation

Hardware Purchase (£16,000): Hardware bought on the ASTUTE project was purchased at the front end of the project. These items are now reaching, or have now reached, the end of their useful life and it is no longer possible to use the hardware for ASTUTE 2020 therefore a small budget (£16k) has been set aside for ICT hardware for project staff, including laptops for general use in the office and in the field together with higher specification systems for running specialist engineering software for use in collaborative projects with companies. Costs per FTE are as follows: £16,000/10.19 FTE/20 Qtrs = £78.50 per FTE per Qtr.

(iii) Travel & Transport (£57,810.00):

Staff travel and subsistence costs include costs for transportation, accommodation and subsistence for company visits and management meetings.

Admin Team 1.65FTE

Travel & Subsistence:

On average 3 meetings in Swansea per Qtr: £50 per FTE (£16 return train fare) **Total: £1,650**

Technical Team 7.2 FTE

Domestic Travel:

- Half Day visit to stakeholders and joint beneficiaries = £75 average (£45 car hire, £30 fuel)
- All Day visits to stakeholders and joint beneficiaries = £110 average (£45 car hire, £30 fuel, £35 subsistence)
- 2-day company visit = £235 average (Overnight accommodation £110, £45 Car Hire, £30 fuel, £50 subsistence)

If every FTE makes on average 6 half day visits, 4 full day visits and 2 two day visit the cost will be £1360 per FTE per year. For average of 7.2 FTEs over 5 years this approximates to **£48,960**

International conferences costs on average:

- flight £ 300.00
- hotel £ 280.00
- transfer £120.00
- subsistence £100.00
- conference fees £200.00

For average of 7.2 FTEs attending one conference during the life of the project this approximates to **£7200**

Total Travel & Subsistence costs: **£57,810** (£1,650 + £48,960 + £7,200)

Staff costs (£2,997,546):

Project Delivery Staff (£2,061,167): these consist of salaries for the Strategic Technology Manager, Senior Project Officers, Project Officers and a Technical Team Support Officer who will between them deliver the RD&I projects with companies, total mean technical team size over five years: 7.2 FTE).

Table 7.5 CU technical staff salary information

Job Title	Anticipated Grade & Pt (at appointment)	University Total Annual Employment Costs @ 1.7.15	Total for ASTUTE 2020
Technical Manager	8[ ]	£59,763 - £73,981	
Snr Project Officers	7[ ]	£49,744 - £61,618	
Project Officers	6[ ]	£49,744 - £61,618	
Technical Team Support Officer	4[ ]	£26,449 - £33,683	
Total average technical staff FTE over 5 years =7.2 FTE			**£2,061,167**

[Information Redacted in table 7.5 above – section 40 (2)]

Project Management (£401,379): these consist of salaries for a small administration team (total mean admin team size over five years: 1.65 FTE) who will ensure the administrative requirements of the operation are fully met and that project delivery proceeds on time, on budget and to an appropriately high quality standard.

Table 7.6 CU admin staff salary information

Job Title	Anticipated Grade & Pt (at appointment)	University Total Annual Employment Costs @ 1.7.15	Total for ASTUTE 2020
Head of Project Support	8[ ]	£59,763 - £73,981	
Research Operations Manager	7[ ]	£49,744 - £61,618	
Snr Admin Officer	6[ ]	£39,092 - £49,744	
Finance Officer	5[ ]	£31,651 - £39,092	
Admin Officer	4[ ]	£26,449 - £33,683	
Total average admin staff FTE over 5 years = 1.65 FTE			**£401,379**

[Information Redacted in table 7.4 above – section 40 (2)]

Academics (£535,000.00): The estimated contribution by academic staff is based on approx. 10,150 hours from academics (based on the likely mix of Lecturers, Senior Lecturers/Readers and Professors)

Table 7.7 CU academic staff salary information

Job Title	Anticipated Grade & Pt (at appointment)	University Total Annual Employment Costs @ 1.7.15	Total for ASTUTE 2020
Academics	8 [ ]	£59,763 - £73,981 pro rata	£535,000.00
Total average academic FTE over 5 years = 1.34 FTE			**£535,000.00**

[Information Redacted in table 7.4 above – section 40 (2)]

7.8.6 Aberystwyth University - Costs for Core Engineering activity

The budget for Aberystwyth University consists of the following categories:

(i) **Administration – Consumables (£3,500):** The consumable budget will be used for supplies that the operation needs over the 3.5 years of Aberystwyth's technical contribution. This has been calculated as £1000 per full-time FTE per year. Costs are estimated at approx. £3.5k based on experience in the last ASTUTE where the anticipated budget could not be spent. As a consequence, the consumables budget for this operation has been reduced in comparison.

(ii) **ICT: Hardware Purchase (£2,500):** The ICT hardware budget will be used for a computer for the project officer, with an upgrade half way through the operation; costs are estimated at £2.5k. These will be purchased through Information Services within the University which use national agreements to purchase computers. We will be reusing the admin IT equipment bought on the previous ASTUTE project, but software development needs powerful desktop computers running the latest software, and that means that the computer for the Project Officer needs to be up to date.

(iii) **Travel & Transport (£4,152):** This allocation will be used to attend operation management meetings and visits to meet companies interested in or engaged in collaborative projects with

Aberystwyth University. Aberystwyth University's somewhat remote position means that some trips, even within Wales, need to be made on an overnight basis. Therefore we have estimated the travel budget by one trip per month to either a company of a partner site over the 42 months that we are involved in the project. We have planned that most of those meetings will be day trips, and 1 each year will be an overnight trip. We have chosen own vehicle rather than car hire as it often works out more convenient - however, the costs for using car hire for this kind of journey are very similar. The University's recommendation is that it is cheaper to use hire cars at journeys of more than 100 miles.

Costs for each type of trip were estimated as follows:

Day visits to stakeholders and joint beneficiaries (two people, sharing car) = £84 average (160 miles at 40p per mile, £20 subsistence). Hence £42 per person per visit.

Overnight visits to further away stakeholders or early start meetings (two people, sharing car) = £240 average (200 miles at 40p per mile, £160 subsistence). Hence £120 per person per visit.

Given 38 day visits at £84, and 4 overnight visits at £240, that makes a total of £4,152.

(iv) **Staff costs (£228,475.77):**

Project Delivery ([Information Redacted – section 40 (2)]): The Project officer will carry out collaborative projects with companies, and do the main work of delivering the operation. One full-time project officer salary over 3.5 years has been budgeted.

Table 7.8 Aberystwyth technical staff salary information

Job Title	FTE	Contract Length	Grade & Pt (at appointment)	Current Total Annual Employment Costs (@ 1.7.15)	Total for ASTUTE 2020
Project Officer	1	3.5 years	7 [ ]		

[Information Redacted in table 7.8 above – section 40 (2)]

Project Management ([Information Redacted section 40 (2)]): Costs for administrative staff will cover the expenses of making sure that Aberystwyth records all the information necessary on progress and deliverables concerned with the operation. They have been calculated at six hours per week.

Table 7.9 Aberystwyth administrative staff salary information

Job Title	FTE	Contract Length	Grade & Pt (at appointment)	Current Total Annual Employment Costs (@ 1.7.15)	Total for ASTUTE 2020
Project Administrator	0.164384	3.5 years	5 [ ]		

[Information Redacted section 40 (2)]

Academics ([Information Redacted section 40 (2)]): Academic match funding is based on the assumption that a senior academic will contribute 17 hours per month to the operation for the duration of three years.

(v) **Human Resources**: Redundancy (£1,779): All redundancy payments will be in line with the University's statutory requirements and the Eligibility Rules for this programme. We have calculated redundancy based on statutory rights for length of service, based on members of staff working full-time on ASTUTE 2020 for its duration. Charges to the ASTUTE 2020 project will only be made for the years that were worked on ASTUTE, not for all employment at Aberystwyth University.

7.8.7 University of Wales Trinity Saint David - Costs for Core Engineering activity

The budget for UWTSD consists of the following categories:

(i) Administration – Consumables (£236):

UWTSD claimed £350 in this category in the previous ASTUTE project. We have estimated a modest £236 allocation for administrative consumables for ASTUTE 2020.

(ii) ICT (£8.5k):

Hardware Purchase (£4k): We estimate £4k for ICT hardware based on likely expenditure of two laptops for two project officers for supporting relevant software for NDT project work e.g. for thermographic and ultrasonic analysis of experimental data. One laptop computer per project engineer: mobile workstation specification: estimated costs (based on Dell precision 4800 typical example): £2000 per project officer. Total £4,000 for two project officers. Three quotes will be obtained for the IT equipment purchases. UWTSD purchased only one laptop in the previous ASTUTE project, which was a Dell latitude E6510 in 2011. This laptop will be five years old when UWTSD starts appoints its projects engineers for ASTUTE 2020 and it will need replacing to cope with new software application requirements.

Software Purchases (£4.5k): Software licence costs of £4,500 are based on continuation of ANSYS/ABAQUS licences. The ASTUTE 2020 budget will make a contribution to these costs, the University making an additional contribution.

(iii) Travel & Transport (£1,5k):

This allocation will be used to attend operation management meetings and for visits to companies. Previous expenditure for UWTSD on first the ASTUTE was £996 with one Project Officer employed for three years. We are intending to employ two Project Officers over a period of three years and we estimate the costs for the type and location of companies we intend to collaborate with and support at £1.5k.

For each Project Officer estimate

10 half day visits per annum, with £10 subsistence and £10 local travel costs (majority of

specialist NDT collaboration will be within 50 mile radius of UWTSD) gives £200 per annum per Project Officer. For two Project Officers over three years this generates an estimate of £1200.

In addition, visits by academic staff to stakeholders and joint beneficiaries:

3 half day visits per annum, with £10 subsistence and £5 local travel costs(majority of specialist NDT collaboration will be within 50 mile radius of UWTSD) gives £45 per annum per project engineer. For two academics over three years this generates an estimate of £270

Estimate four inter-university meetings per annum: four per annum @ £2.5 per event = £10 per annum . For three years = £30.

(iv) Staff costs (£230,308.10):

Project Delivery (£189,263.78): Two Project Officers with strong experience in NDT will be employed for the duration of three years starting from mid 2016. This will enhance UWTSD's specialist contribution in this area, and reflects the successful delivery of targets in NDT that UWTSD achieved in the previous ASTUTE project. Costs in this category are estimated at approx. £190k for one Research Engineer (Project Officer) starting at [ ] grade 4 and one Senior Research Engineer (Senior Project Officer) starting at [ ] of grade 5.

Table 7.10 UWTSD technical staff salary information

Job Title	FTE	Contract Length	Grade & Pt (at appointment)	Current Total Annual Employment Costs @ 1.7.15	Total ASTUTE 2020
Project Officer	1	3 Years	4 [ ]		
Senior Project Officer	1	3 Years	5 [ ]		
					£189,263.52

[Information Redacted in table 7.10 - section 40 (2)]

We note the requirements from WEFO on evidence of staffing costs and this evidence will be maintained by our European office,

Academics (£41,044.32): The estimated contribution of £41,044.34 by academic staff is based on proportions of three specific academic staff on the project, starting from July 2016 through to December 2019 i.e. 42 months: One grade 8[ ], one grade 7 [ ] and one Manager [ ] for [ ] over the operation lifetime. [Information Redacted - section 40 (2)]

(v) Accommodation: Furniture & Equipment (£500): An allocation of £500 for equipment is based on the likely expenditure on NDT probes, cabling and sensors relevant to our specialist contribution.

All procurement will be carried out in line with UWTSD's Financial Regulations. UWTSD recognises its responsibility to achieve value for money (VFM) from all its activities, however they may be funded. The University is committed to the pursuit of economy, efficiency and effectiveness as part of its corporate and academic strategy and will seek to adopt good practice and incorporate VFM principles in all its activities. To achieve good VFM, the University has set itself these objectives:

- to integrate VFM principles within existing management, planning and review processes
- to adopt recognised good practice where this makes sense
- to undertake VFM studies on areas of activity identified as worthy of review
- to benchmark the institution's activities against other similar activities and organisations where this is considered useful
- to respond to opportunities to enhance the economy, efficiency and effectiveness of activities
- to promote a culture of continuous improvement
- to demonstrate actively to both internal and external observers that the achievement of VFM is sought in all activities undertaken
- to ensure that all staff recognise their continuing obligation to seek VFM for the institution as part of their routine activities.

7.8.8 Match Funding

The HEI partners will contribute significantly to the costs for delivery of the ASTUTE 2020 operation through existing staff (mainly academics) time and overheads. We are also expecting equipment contributions from industry and possibly from the Universities.

(i) Academic members of staff will be directly involved in RD&I projects in a steering and advisory role with their expertise corresponding to the Adaptive Smart Specializations and through managing and steering the operation as part of the Executive Management Committee, the Stakeholder Advisory Board and the Project Committee. Other existing University staff (e.g. specialist technicians) will also be involved in supporting the technical work when required. From experience we expect that academics and specialist technicians will contribute approx. 15 % of the 222,700 person hours required for collaborations (33,400 hours). The Deputy Directors, the lead PIs for Cardiff, Aberystwyth and UWTSD and the leaders of the Adaptive Smart Specialisation areas will need approx. 3200 hours for managing and steering the operation. This is in addition to the technical ASTUTE 2020 employees needed for the successful delivery of the Operation. Where required, staff will provide timesheets as evidence of the proportion of time devoted to the ASTUTE 2020

operation. This will result in approx. £1.6m of match funding from staff time; further breakdowns are provided below for each partner.

Swansea University: We estimate an input of approx. 24,391 hours from existing University staff (equivalent to 16 individuals contributing 1 day per week to the Operation). This will be made up of approx. 19,750 hours from academics (Professors, Readers and Lecturers within the three Adaptive Smart Specialisations) and approx. 4,641 hours from specialist technical staff. The first group will be counted under the WEFO category of "Staff: Academics" while the second will be counted under "Staff: Project Workers". For calculating the budget we have used an approximate average hourly rate based on the likely mix of professors, readers, lecturers (£45) and other specialist technical staff (£18.75). However, when quarterly claims are submitted to WEFO we will use the exact hourly rates of the actual salaries of each staff member.

Swansea University has estimated an average cost of £45 per hour for the academic members of staff that will be providing contributions. We have tentatively estimated that there will be around 14 of these contributing approximately one day per week over the main part of ASTUTE 2020:

- We have calculated the hourly rates for match academic staff that were submitted in the claims to WEFO under the previous ASTUTE project.

- For each academic, we obtained from the central University administration teams the monthly total employment costs (the gross salaries plus employer's NI and employer's pension costs). We divided the annual costs by (1547/12) to obtain an hourly rate. 1547 is the effective number of hours per year. It is an established figure that is obtained by taking the number of weekdays per year and subtracting the annual leave days and bank holidays, and then multiplying the figure by 7 (the working week is assumed to be 35 hours, hence 7 hours per day).

- From the results obtained we observed that the hourly rates of the individual academics were generally in the range of £25 per hour to £75 per hour. The average came out around £42 per hour and so, allowing for inflation, we would estimate an average cost of £45 per hour over the period 2015 to 2020"

Cardiff University: Cardiff academics have an estimated average hourly rate of £52.70 based on 10 academic staff at Senior Lecturer grade (based on the likely mix of Lecturers, Senior Lecturers/Readers and Professors) regularly contributing to the operation over its 5 year lifetime. They will each contribute 29 days per year (based on 7 hour days). We have calculated the hourly rates from a pool of academic staff that are likely to be contributing to projects in ASTUTE 2020. For each academic, we obtained from the central University administration teams the monthly total employment costs (the gross salaries plus employer's NI and employer's pension costs). We divided the annual costs by (1505/12) to obtain an hourly rate. 1505 is the effective number of hours per year. It is an established figure that is obtained by taking the number of weekdays per year and subtracting the annual leave days and bank holidays, and then multiplying the figure by 7 (the working week is assumed to be 35 hours, hence 7 hours per day). The average is £52.70 per hour

Aberystwyth University: Academic match funding is based on the assumption that a senior academic will contribute 17 hours per month to the operation for the duration of three years.

UWTSD: The estimated contribution of £41,044.34 by academic staff is based on proportions of three specific academic staff on the project, starting from July through to December 2019 i.e. 42 months. One grade 8[ ], one grade 7 [ ] and one Manager [ ] for [ ] over the operation lifetime. [Information Redacted - section 40 (2)]

(ii) The University partners will also contribute the overheads of the operation as match funding. As outlined above, indirect costs have been calculated as a 25% flat rate of the total applicable direct costs but excluding costs for subcontracting, generating a further £2.9m. This is calculated following the Simplified Cost Options model, and we note that this covers only a small fraction of the real costs incurred by the ASTUTE 2020 partner universities in this section, which we estimate could be three times as big as the stated value.

(iii) Cash and In kind contributions: We are expecting cash contributions from Swansea University in form of equipment and hardware required for the operation. It might also be possible for us to secure in kind donations from companies for equipment and/or ICT hardware. We have achieved this successfully in the last ASTUTE and expect to raise a further £75k of match funding in equipment and £75k in ICT hardware with this approach. The value will be capable of being independently assessed and verified and we will provide evidence that the contributed equipment is essential for our RD&I collaborations. We are aware of the guidelines in terms of 'Contributions in kind' and will ensure that these contributions satisfy the 'Eligibility Rules and Conditions for support from the European Structural Funds ERDF 2014-2020''.

We thus expect the HEI partners and industry to contribute around £4.7m to the delivery of the operation. All match funding will be clean funding. Other sources of potential match funding from central services have been explored; it is expected that all contributions from central services will be covered by the overheads. External sources of possible match funding from non- ESIF grants have been considered but no appropriate options have been identified. This leaves a funding gap of approx. £10m which we request to be met by the ERDF grant.

7.9 Intervention Rates

The Intervention Rate that results from the above calculations are presented in Table 7.11.

Table 7.11 Intervention Rates

Capital Intervention Rate	86.68%
Revenue Intervention Rate	66.80%
Overall Intervention Rate	**68.33%**

7.10 Compliance with UK and EU legislation

The proposed ASTUTE 2020 operation will employ a core administrative team with extensive experience in ensuring EU projects comply with relevant legislation.

One of the key considerations will be State Aid compliance. We have taken professional formally procured legal advice from [[Information Redacted – section 40 (2)] of DWF LLP, a specialist law firm who advises Universities on State Aid issues. A draft letter of advice is presented in Appendix XII.

We need to consider State Aid from two perspectives; that of the HEIs and that of the enterprises. Appendix XII outlines ASTUTE 2020's interaction mechanisms with companies and the respective State Aid compliance.

8 Value for Money

This chapter provides a quantitative indicative prediction of the benefits of ASTUTE 2020 to WWV. This demonstrates that the delivery mechanism we are proposing represents optimal value for money in the use of ERDF funds. A breakdown of operation costs is also included.

We must add at this point that although we have been very diligent in doing this analysis, it must be seen in the wider political and economic context of major economies around the world experiencing substantial reductions in manufacturing and related activities, e.g. China, with anticipated further downturns across the world, and also the uncertainties surrounding the UK decision whether to stay in the EU or to leave it. These two events could have unforeseeable and significant impact on the manufacturing industry in WWV and thereby on the anticipated success of ASTUTE 2020. These factors are not captured in our analysis.

8.1 Cost Benefit Analysis

We present in this section a detailed cost benefit analysis of the chosen option for delivery of ASTUTE 2020. This is carried out over a 10 year timescale and incorporates the use of a discount rate to calculate Net Present Value (NPV) and an "optimism bias" adjustment to help ensure conservative values are used for long term projections. Consideration of alternative delivery options are then provided in section 8.2 that follows.

The benefits of the operation have been divided into separate elements that are listed in Table 8.1, which includes the rationale for their calculation.

Table 8.1 Elements of Benefit of the ASTUTE 2020 Operation

Salaries of Jobs Created during Operation	We are assuming that there will be approximately 80 jobs created in the companies we work with during the timescale of the ASTUTE 2020 operation, and that these will continue to exist on average for at least five years after the end of the operation. The aggregated salaries of these jobs will represent a considerable benefit.

Salaries of Jobs Created post Operation	The Final Evaluation of ASTUTE, carried out by Ciotek Ltd. in 2015, reported that companies were projecting that a further 251 jobs would be created in the long term beyond the completion of ASTUTE. For ASTUTE 2020 we are taking a more conservative approach to these long term predictions, because (a) the budget for the Operation is smaller, and (b) the weakness of the Euro, compared to the position five years ago, is likely to make it more difficult for UK manufacturers that export to the rest of Europe and/or compete with companies in the Eurozone. We are thus assuming that the situation that might exist at the conclusion of ASTUTE 2020 would be that companies would be projecting a further 125.5 jobs created over the following five years, (i.e. half that projected in the final Evaluation of ASTUTE).
Salaries from grant used in WWV HEIs	A significant proportion of the ERDF grant will be spent on the salaries of people employed within those HEIs that lie within West Wales and the Valleys. This will represent an economic benefit to the area and is therefore included in the analysis. Salaries of those employed in HEIs outside WWV have been excluded from this. At the current time we estimate that at least £5 million will be spent on salaries in WWV over the 5 year duration of the operation.
Investment During Operation	Based on our experience with ASTUTE over the period 2010 to 2015, we would expect companies to report at least £5 million of investment as a result of the ASTUTE 2020 operation. This will include, but will not be limited to the indicator “Private investment matching public support in innovation or R&D projects”.
Investment Post Operation	The Final Evaluation of ASTUTE, carried out by Ciotek Ltd. in 2015, reported that companies were projecting that a further £210 million of Investment would be made in the long term beyond the completion of ASTUTE. Using the same approach to Jobs Created post Operation, we are thus assuming that the situation that would exist at the conclusion of ASTUTE 2020 would be that companies would project half of this, £105 million. We have adjusted this figure for inflation and assumed that the investment would take place over a period of five years after completion of ASTUTE 2020.
Increased Business (Post Operation)	The Final Evaluation of ASTUTE also reported that companies were projecting that a further £203 million of additional business would be generated in the long term beyond the completion of ASTUTE. Using the same approach to Jobs Created post Operation, we are thus assuming that the situation that would exist at the conclusion of ASTUTE 2020 would be that companies would project half of this, £101.5 million. We have adjusted this figure for inflation and assumed that this business would be realised over a period of five years after completion of ASTUTE 2020.

The overall cost of the Operation is taken as the ERDF Grant value of £10,000,000.

8.1.1 Assumptions

In performing the Cost Benefit Analysis it is necessary to make some assumptions about economic behaviour. These are listed in Table 8.2 below.

Table 8.2 Key Assumptions for Calculation of the Cost-Benefit Analysis

Average Initial Salary	£25,000	We have used the same figure as the conservative value used for average manufacturing salaries in the Final Evaluation report provided by Ciotek. This is used in the calculation of the jobs created and safeguarded.
Annual Salary Inflation	2%	This is the UK Government's target rate[36] for inflation as at June 2015.
Discount Rate (for NPV)	3.50%	We understand this is the desired level that WEFO would like to use for these calculations.
Optimism Bias Adjustment Factor	0.25	This value was chosen by Ciotek in the Final Evaluation to generate a conservative figure for the forward projections of companies.
Economic Multiplier for Additional Economic Benefits	1.33	This has been chosen from a range of other studies related to manufacturing as outlined below.

8.1.2 Basic Cost Benefit Calculation

The results of the basic cost-benefit analysis are provided in the "Direct Value" column of Table 8.3, which shows the contribution from the different elements of benefit over the 10 year timescale. The total benefit is approximately £274 million, with a net benefit (benefit minus cost) of £264 million. This equates to a return on investment of 2638%, or a surplus of £26 for every £1 invested.

[36] http://www.bankofengland.co.uk/monetarypolicy/Pages/framework/framework.aspx

Table 8.3 Cost-Benefit analysis with Net Present Value (NPV) for ASTUTE 2020 over a 10 year timescale

	Direct Value	Additional Value	Direct and Additional Value	PV	PV with Optimism Bias Adjustment
Salaries of Jobs Created during Operation	£15,217,699	£20,239,539	£35,457,238	£27,721,675	£27,721,675
Salaries of Jobs Created post Operation	£11,178,194	£14,866,997	£26,045,191	£19,327,912	£4,831,978
Salaries from grant used in WWV HEIs	£5,000,000	£0	£5,000,000	£4,515,052	£4,515,052
Investment During Operation	£5,000,000	£6,650,000	£11,650,000	£10,280,965	£10,280,965
Investment Post Operation	£119,935,531	£159,514,256	£279,449,787	£214,387,794	£53,596,949
Increased Business (Post Operation)	£117,442,167	£156,198,082	£273,640,249	£205,286,971	£51,321,743
Benefit Total	£273,773,590	£357,468,875	£631,242,465	£481,520,370	£152,268,362
ERDF Grant	-£10,000,000		-£10,000,000	-£9,030,105	-£9,030,105
Cost Total	**-£10,000,000**		**-£10,000,000**	**-£9,030,105**	**-£9,030,105**
Grand Total	£263,773,590	£357,468,875	£621,242,465	£472,490,266	£143,238,258
(Benefit-Cost)/Cost	2638%		6212%	5232%	1586%
Surplus for every £1 put in	£26		£62	£52	£16

8.1.3 Additional Benefits and Economic Multipliers

The Direct Value column in Table 8.3 lists only the benefits received by the supported companies and the HEIs. It does not include additional benefits to the local economy that would arise from the increased spending by the individuals whose jobs have been created, or the increased spending by the companies in the local supply chain.

It is widely accepted that manufacturing provides additional economic benefits beyond the immediate jobs associated with the manufacturing companies. There is thus a significant economic multiplier attached to the manufacturing sector, which has been the subject of many economic studies.

Nosbusch and Bernaden[37] have considered the multiplier effect of manufacturing and reported a range of values for the multiplier which can be as high as 16 to 1 for some advanced manufacturing sectors. The emphasis on additional benefits near to the manufacturing site was demonstrated by reference to a study of an Intel plant in the US state of Oregon. It was found that every 10 jobs at Intel supported another 31 jobs in other sectors of the Oregon economy, at above average wages. Thus the economic multiplier in this case is 3.1. What is particularly significant here is that the population of Oregon is around 4 million, which is only slightly larger than Wales at 3 million. So we can be confident that assisting manufacturing companies in WWV will have considerable additional benefits which will be felt within this relatively small geographical area.

There have been many other studies of economic multipliers for manufacturing. The Manufacturers Alliance for Productivity and Innovation[38] cited multipliers in the region of 1.92 for manufacturing. Moretti[39] found that "for each additional job in manufacturing in a given city, 1.6 jobs are created in the nontradable sector in the same city", which suggests a multiplier of at least 1.6. Furthermore, skilled jobs in manufacturing generate 2.5 jobs in local goods and services, according to this study.

The US Manufacturing Institute[40] is slightly more conservative, assigning a value of 1.33 to the manufacturing multiplier, but confirming that this sector is the one with the highest multiplier.

We have thus chosen this more conservative figure of 1.33 to use as the economic multiplier for additional economic benefits in the analysis of Table 8.3. This generates an additional benefit of £357 million, so that the total of direct and additional benefits from ASTUTE 2020 over 10 years is £631 million, or a £62 surplus for every £1 invested.

8.1.4 Net Present Value

Since much of the benefit of ASTUTE 2020 will be long term, it is appropriate to modify this analysis to determine the Net Present Value (NPV) of these costs and benefits.

The Present Value, *PV*, of any future financial Benefit, *B*, is calculated as follows:

$$PV = \frac{B}{(1+i)^t}$$

Where *t* is the number of years from the present time when the Benefit will be realised, and *i* is the "Discount Rate". A similar formula exists to calculate the Present Value of a future Cost, C:

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[37] "The Multiplier Effect: There Are More Manufacturing Related Jobs Than You Think", Nosbusch, K.D. and Bernaden, J.A., Manufacturing Executive Leadership Journal, http://www.wmep.org/sites/default/files/Rockwell_0312_Final.pdf

[38] "The Competitive Edge: Manufacturing's Multiplier Effect", Gold, S, Industry Week, September 2 2014. http://www.industryweek.com/global-economy/competitive-edge-manufacturings-multiplier-effect-its-bigger-you-think

[39] "Local Multipliers", Morettti, E., American Economic Review: Papers & Proceedings 100 (May 2010): 1–7 http://www.aeaweb.org/articles.php?doi=10.1257/aer.100.2.1

[40] http://www.themanufacturinginstitute.org/Research/Facts-About-Manufacturing/Economy-and-Jobs/Multiplier/Multiplier.aspx

$$PV = -\frac{C}{(1+i)^t}$$

For example, the Present Value of a benefit of £1,000,000 payable in 5 years' time is (with a discount rate of 3.5%):

$$\frac{£\,1{,}000{,}000}{(1+0.035)^5} = £\,841{,}973$$

Where there are several benefits and costs that are distributed over a range of years, the Net Present Value, *NPV*, can then be calculated as follows:

$$NPV = B_0 - C_0 + \frac{B_1}{(1+i)} - \frac{C_1}{(1+i)} + \frac{B_2}{(1+i)^2} - \frac{C_2}{(1+i)^2} + \frac{B_3}{(1+i)^3} - \frac{C_3}{(1+i)^3} \ldots\ldots etc.$$

Which can be written in a more compact form:

$$NPV = \sum_{t=0}^{N} \frac{R_t}{(1+i)^t}$$

Where R_t is the sum of all benefits minus all costs in year *t*, and there will be N years over which the calculation is performed. If there are any immediate benefits or costs or benefits at the beginning of the first year these can be counted in the term R_0.

In Table 8.3, we have therefore applied a discount rate of 3.50% to these figures and the resulting values are presented in the "PV" column. The "Grand Total" of this column thus represents the Net Present Value. As can be seen, the NPV of these costs and benefits is now £472 million, or a £52 surplus for every £1 invested.

8.1.5 Optimism Bias

A significant proportion of the overall benefit for ASTUTE 2020 is derived from values projected by the companies in the current ASTUTE project for Jobs Created, Investment and Increased Business. These were reported in the Final Evaluation of ASTUTE carried out by Ciotek Ltd. There is always a danger that such long term predictions can be subject to a degree of inaccuracy due to optimism on behalf of the companies. In the Final Evaluation, Ciotek suggested adopting a conservative approach to these projections in which the values provided by the companies are multiplied by 0.25. We have thus adopted an identical figure as an "optimism bias adjustment factor". This has been applied to the NPVs of the post operation benefits, and the results are displayed in the final column of Table 8.3

The final total for the NPVs of the benefits minus costs of ASTUTE 2020 is thus £143 million, or a £16 surplus for every £1 invested.

Figure 8.1 indicates how the Net Present Value will accumulate over the 10 year timescale.

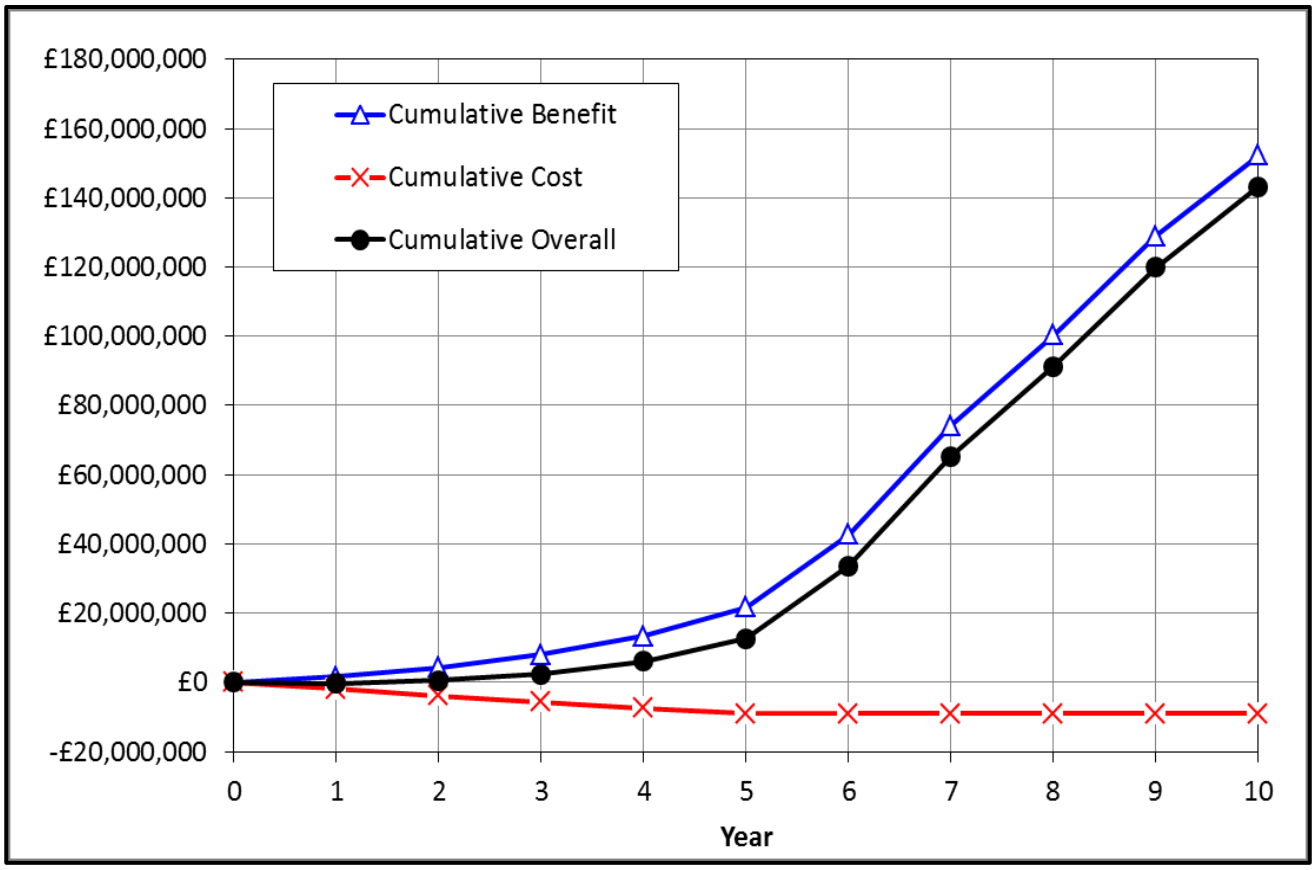


Figure 8.1 Cumulative Cost-Benefit figures (with NPV) for ASTUTE 2020

8.2 Comparison to Other Options

At this stage it is appropriate to consider the equivalent analyses for some of the options that were described in the Chapter on Delivery.

Using the above methodology we have considered the following alternative options, in addition to the chosen option described in the previous section:

i. Do nothing (i.e. grant not used)
ii. Pay the ERDF grant (£10 million) directly to the companies
iii. Pay the ERDF grant (£10 million) to the companies on condition they use it to collaborate with the Universities
iv. Pay the ERDF grant (£10 million) to Universities across the UK and/or Europe

The results of these analyses are presented in Table 8.4 and Figure 8.2.

Table 8.4 Cost-Benefit analysis with Net Present Value (NPV) for ASTUTE 2020 over 10 years. Comparison of alternative options.

Option (i)	£0
Option (ii)	£35,593,808
Option (iii)	£69,251,711
Option (iv)	£64,736,658
Chosen Option	£143,238,258

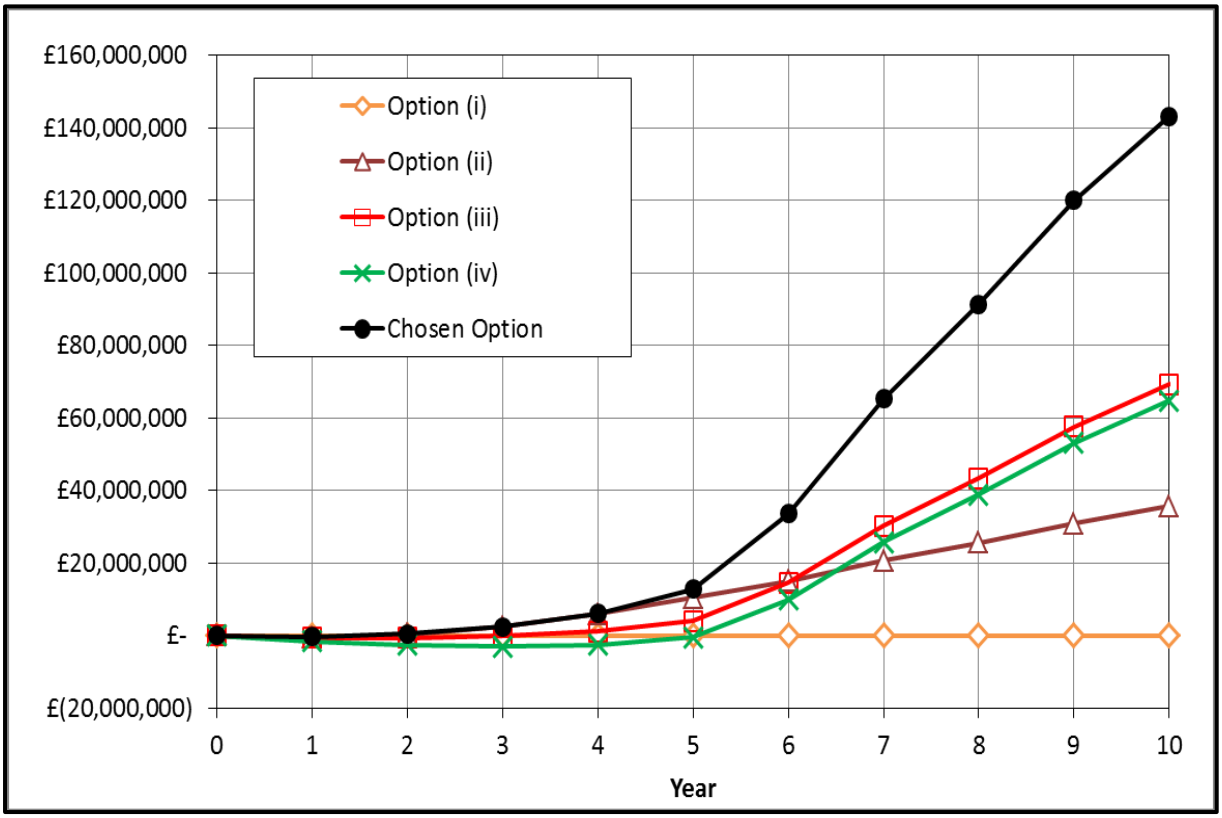


Figure 8.2 Cumulative Cost-Benefit figures (with NPV) for different options.

In the case of option (i) there will be no cost and no benefit, so that the Net Present Value will be zero.

For option (ii) it was discussed that it would be likely that the companies might use it to subsidise normal business expenditure or for short term investment with no long term strategy, hence the benefits would be mainly short term. We have assumed here that potentially 40 jobs could be created by the companies using the grant money, and that only 10% of the long term benefits described for the chosen option are realised. In this case the net present value figure is £36 million.

For option (iii) the Universities would receive funding via the companies on an intermittent, ad-hoc

basis. In this case the Universities could not provide match funding, and they would need to apply full economic costing instead of the 25% overheads under the current simplified cost option. There would be some scope for strategic work with some long term benefits to companies, but the unstable nature of this income stream would mean it would be very difficult to recruit and retain suitably qualified staff. Having to hire and fire staff at short notice would have a further negative impact on output. As a result and as an optimistic estimate, the £10 million grant would probably only "purchase" 50% of the amount of work at Universities compared to the chosen option. Net Present Value in this case is calculated as £69 million.

For option (iv), again the Universities outside Wales would not match fund the operation and they would again need to apply full commercial costing mechanisms. Companies would be much less willing to collaborate, given the distances involved (this fact was discussed at a recent EU expert workshop at Brussels[41]) and a greater proportion of the grant would have to be spent on travelling compared to the chosen option. So again we would estimate that this would reduce the effectiveness by 50%. In addition, the benefit of salaries from grant used in HEIs in WWV would also disappear, so that Net Present Value becomes £65 million.

So from the foregoing argument we are confident that the chosen option provides optimum value for money for WWV, as it yields the greatest Net Present Value, £143 million.

[41] SMEs readiness factors for adopting Advanced Manufacturing products and modernise their business, Brussels, 10th February 2015.

8.3 Operation Costs Breakdown

An overview of the ASTUTE 2020 operation costs by partner and total is presented in Table 8.5.

Table 8.5 ASTUTE 2020 Operation Costs

Key:
Match Funding

Financial Profile : ASTUTE 2020			Total	Partners				
				Aberystwyth	Cardiff	Swansea CST	Swansea TD	UWTSD
Accommodation								
Furniture & equipment	Actual	Capital	**75,000.00**	0.00	0.00	0.00	75,000.00	0.00
Furniture & equipment	Actual	Capital	**54,839.60**	0.00	0.00	0.00	54,839.60	0.00
Furniture & equipment	Procurement	Capital	**493,420.00**	0.00	0.00	0.00	492,920.00	500.00
TOTAL ACCOMMODATION			**623,259.60**	**0.00**	**0.00**	**0.00**	**622,759.60**	**500.00**
Administration								
Consumables	Actual	Revenue	**205,419.34**	1,500.00	27,728.00	6,000.00	170,191.34	0.00
Consumables	Procurement	Revenue	**132,936.00**	2,000.00	8,700.00	12,000.00	110,000.00	236.00
TOTAL ADMINISTRATION			**338,355.34**	**3,500.00**	**36,428.00**	**18,000.00**	**280,191.34**	**236.00**
Estates								
Renovation	Procurement	Capital	**45,000.00**	0.00	0.00	0.00	45,000.00	0.00
TOTAL ESTATES			**45,000.00**	**0.00**	**0.00**	**0.00**	**45,000.00**	**0.00**
Human_Resources								
Recruitment	Actual	Revenue	**6,000.00**	0.00	0.00	1,000.00	5,000.00	0.00
Redundancy	Actual	Revenue	**22,779.00**	1,779.00	0.00	6,000.00	15,000.00	0.00
TOTAL HUMAN_RESOURCES			**28,779.00**	**1,779.00**	**0.00**	**7,000.00**	**20,000.00**	**0.00**
ICT								
Hardware Purchase	Actual	Capital	**75,000.00**	0.00	0.00	0.00	75,000.00	0.00
Hardware Purchase	Actual	Capital	**60,300.00**	0.00	0.00	10,300.00	50,000.00	0.00
Hardware Purchase	Procurement	Capital	**322,500.00**	2,500.00	16,000.00	0.00	300,000.00	4,000.00
Software Purchase	Actual	Revenue	**149,439.99**	0.00	36,000.00	3,000.00	105,939.99	4,500.00
Software Purchase	Procurement	Revenue	**44,560.00**	0.00	0.00	0.00	44,560.00	0.00
TOTAL ICT			**651,799.99**	**2,500.00**	**52,000.00**	**13,300.00**	**575,499.99**	**8,500.00**
Professional_Service								
Evaluation, development & monitoring	Procurement	Revenue	**111,500.00**	0.00	0.00	111,500.00	0.00	0.00
Accountancy & Audit	Procurement	Revenue	**4,000.00**	0.00	0.00	4,000.00	0.00	0.00
Consultancy Fees	Procurement	Revenue	**40,000.00**	0.00	0.00	40,000.00	0.00	0.00
TOTAL PROFESSIONAL_SERVICE			**155,500.00**	**0.00**	**0.00**	**155,500.00**	**0.00**	**0.00**
Travel_Transport								
Travel & Subsistence	Actual	Revenue	**91,782.50**	2,752.00	36,850.00	17,940.00	32,740.50	1,500.00
Travel & Subsistence	Procurement	Revenue	**50,660.00**	1,400.00	20,960.00	11,000.00	17,300.00	0.00
Travel & Transport Other	Actual	Revenue	**2,000.00**	0.00	0.00	2,000.00	0.00	0.00
TOTAL TRAVEL_TRANSPORT			**144,442.50**	**4,152.00**	**57,810.00**	**30,940.00**	**50,040.50**	**1,500.00**
Marketing_Promotion								
Advertising & Promotion	Actual	Revenue	**20,800.00**	0.00	0.00	20,800.00	0.00	0.00
Events	Actual	Revenue	**23,320.00**	0.00	0.00	23,320.00	0.00	0.00
Printing, Production & Reprographics	Actual	Revenue	**6,300.00**	0.00	0.00	6,300.00	0.00	0.00
TOTAL MARKETING_PROMOTION			**50,420.00**	**0.00**	**0.00**	**50,420.00**	**0.00**	**0.00**
Staff								
Project Delivery Staff	Actual	Revenue	**87,018.75**	0.00	0.00	0.00	87,018.75	0.00
Project Delivery Staff	Actual	Revenue	**6,319,991.43**	172,600.00	2,061,167.00	0.00	3,896,960.65	189,263.78
Project Management	Actual	Revenue	**1,808,745.30**	15,106.77	401,379.48	1,187,381.65	204,877.39	0.00
Academics	Actual	Revenue	**1,505,542.09**	40,769.00	535,000.00	0.00	888,728.77	41,044.32
TOTAL STAFF			**9,721,297.56**	**228,475.77**	**2,997,546.49**	**1,187,381.65**	**5,077,585.55**	**230,308.10**
Simplified Cost Options	**Type**							
Flat_Rate	FR-25-RDI	25% of Eligible Dir	**2,900,838.50**	60,101.69	785,946.12	326,760.41	1,667,769.25	60,261.03
TOTAL SIMPLIFIED COST OPTIONS			**2,900,838.50**	**60,101.69**	**785,946.12**	**326,760.41**	**1,667,769.25**	**60,261.03**
TOTAL EXPENDITURE			**14,659,692.49**	**300,508.46**	**3,929,730.61**	**1,789,302.07**	**8,338,846.23**	**301,305.13**
ACTUAL (INC SIMPLIFIED COSTS)			**13,415,116.49**	294,608.46	3,884,070.61	1,610,802.07	7,329,066.23	296,569.13
IN KIND			**0.00**	0.00	0.00	0.00	0.00	0.00
PROCUREMENT			**1,244,576.00**	5900.00	45660.00	178500.00	1009780.00	4736.00
CAPITAL			**1,126,059.60**	0.00	0.00	10300.00	792759.60	500.00
REVENUE (INC SIMPLIFIED COSTS)			**13,533,632.89**	**298,008.46**	**3,913,730.61**	**1,779,002.07**	**7,201,526.63**	**296,805.13**
Investment								
Aberystwyth University	Actual	Revenue	**100,870.69**	0.00	0.00	6,544.76	7,295.26	7,334.26
Cardiff University	Actual	Revenue	**1,320,946.38**	42,714.17	42,864.07	39,710.72	47,007.21	72,226.02
Swansea University	Actual	Revenue	**2,970,277.18**	97,944.29	119,597.76	146,871.98	145,066.29	167,004.29
Swansea University	Actual	Capital	**150,000.00**	0.00	0.00	0.00	0.00	0.00
UWTSD	Actual	Revenue	**101,305.35**	0.00	0.00	0.00	125.00	9,175.80
TOTAL INVESTMENT(EX. GRANT)			**4,643,399.59**	**140,658.46**	**162,461.82**	**193,127.45**	**199,493.77**	**255,740.37**
Grant	Actual	Capital	**976,059.60**	2,500.00	16,000.00	10,300.00	942,759.60	4,500.00
	Capital % Investment Rate		***86.679213%***					
Grant	Actual	Revenue	**9,040,233.55**	197,137.77	2,592,784.49	1,452,241.65	4,602,569.86	195,499.78
	Revenue % Investment Rate		**66.798275%**					
GRANT			**10,016,293.15**	**199,637.77**	**2,608,784.49**	**1,462,541.65**	**5,545,329.46**	**199,999.78**
Overall	**% INTERVENTION RATE**		**68.325396%**					

9 Long Term Sustainability

This section presents a tentative plan for extending the activities of the proposed operation beyond the end of the funding period in 2020. We have a high level of confidence that there will be continued demand from manufacturing industry for the activities provided by the operation beyond 2020, and that these activates will continue to have a positive impact on the economy of WWV. This is based on the feedback we have received from companies who worked with ASTUTE over the period 2010 to 2015, the large number of letters of support for ASTUTE 2020, and the results of the Mid-Term and Final Evaluations of ASTUTE carried out by Ciotek Ltd.

9.1 Idealised Long Term Delivery Model

We have based our vision for the long term future of ASTUTE on the type of business model used successfully by the Fraunhofer Institutes or the High Value Manufacturing (HVM) Catapult. The latter organisation is distributed across seven centres in the UK, and was set up with extensive funding from Innovate UK (Technology Strategy Board) and continues to operate receiving substantial and essential funding from Innovate UK.

The aim of the HVM Catapult is to bridge the gap between early innovation, where the UK has traditionally been strong, and industrial-scale manufacturing, where real wealth is created and the UK is relatively uncompetitive[42]. The HVM Catapult business model is that it aims to fund itself via three independent income streams, as shown in Figure 9.1:

1. One third core public funding (via Innovate UK)
2. One third industry funded contracts (i.e. Contract Research at commercial market rate)
3. One third collaborative R&D funded (which involves distinct research projects part funded by industry and part publically funded through research councils, Horizon 2020 or other Innovate UK sources).

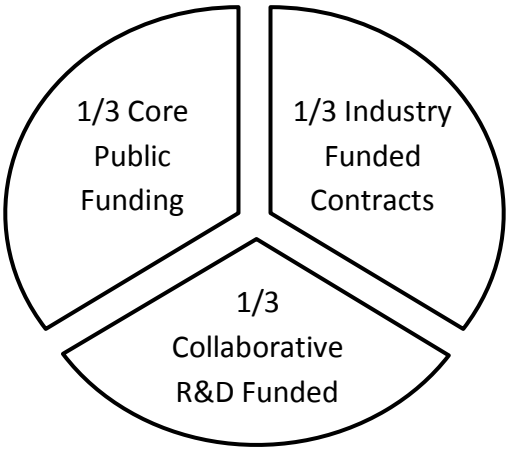


Figure 9.1 Basic business model of the HVM Catapult

[42] https://hvm.catapult.org.uk

This strategy is already showing signs of success. The HVM Catapult has been in existence since 2011, and the results for 2013/14[43] indicated that:

- 45% of income came from industry
- There was a sales order book of £180 Million
- The organization attracted £3.50 of industry and collaborative funding for every £1.00 of core funding from Innovate UK.

So we feel this approach to funding offers a long term solution for ASTUTE which, although not totally funded by the private sector, would clearly deliver good value for money for the public funds that would be used to partially support it.

We also feel that the ASTUE 2020 model is highly relevant to academia – industry collaboration. While each of the catapult centres typically deals with very few, but large scale technologies, applicable to and funded mainly by one or two manufacturers, the ASTUTE 2020 model of working with a highly multidisciplinary team enables flexible and highly responsive collaboration with a wide range of businesses. This has proven to be greatly beneficial, generating economic impact and complimentary to what the catapults offer, which is less suitable for the wide range of companies ASTUTE 2020 is likely to collaborate with.

9.2 Transitional Delivery Model

It is unlikely that we could achieve an immediate change from the model used in ASTUTE 2020 to the type of mechanism used by the HVM Catapult. Therefore we anticipate that towards the end of the proposed ASTUTE 2020 operation we would propose a two year transitional operation to WEFO for further ERDF funding. This new operation would aim to secure a significant amount of contract research from manufacturing companies, both those in WWV and also outside the area. We would also anticipate a significant amount of Collaborative RD&I projects with manufacturing companies in WWV, in which the University contribution would be part funded by EU structural funds from WEFO, as would be the case in ASTUTE 2020. During this short period towards the end we also anticipate starting to attract funding from other public sources with the aim to have it in place at the end of the transition period to be able to operate the post 2022 funding model for ASTUTE 2020.

This would enable a gradual transition towards a more sustainable model from 2022 onwards, as shown in Figure 9.2. Clearly there is no guarantee that EU structural funds will be available to Wales beyond 2022, so our model would allow the option to seek public funding from other sources such as Research Councils (RCUK), which could fund Collaborative RD&I projects, and Innovate UK or the successor to EU Horizon 2020 which may provide some core funding.

[43] https://hvm.catapult.org.uk/documents/2157642/8644253/HVMC+Fact+Book/fea2d7c9-3891-409c-99de-8e862b4d7aa2

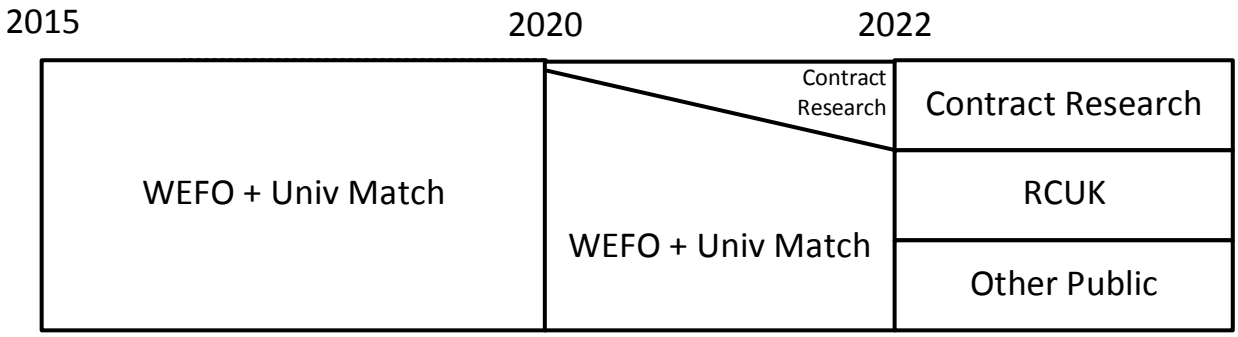


Figure 9.2 Potential income sources leading to long term sustainability post 2022

Appendix I – Research Excellence Framework 2014 Results

This appendix describes the results of the most recent Research Excellence Framework (REF) that are relevant to the ASTUTE partners and to the selection of partners for the proposed ASTUTE 2020 operation. The first section gives some background that describes how the results of the REF are calculated. This is followed by a discussion on the performance of Engineering research in Wales compared to the rest of the UK. The individual REF results of the ASTUTE 2020 partners are then presented. These results are then briefly summarized and compared in the final section. An additional appendix then relates these results to the Adaptive Smart Specialisations that are central to the proposed operation.

(i) Background

The Research Excellence Framework (REF) 2014 (http://www.ref.ac.uk/) assessed the quality of research in UK higher education institutions. All institutions were invited to submit their research work in a range of subject related Units of Assessment (UoA).

For each Institution and for each UoA, the results of the assessment were expressed in terms of the following starred levels:

4*	World Leading
3*	Internationally Excellent
2*	Recognised Internationally
1*	Recognised Nationally
0	Unclassified

The results then present "profiles" that show the proportions of activity judged to meet each of the four starred levels.

From the profiles presented in the REF results it is then possible to calculate a *Grade Point Average* (GPA). For example, if the published profile is 20% at 4*, 40% at 3*, 25% at 2* and 15% at 1*, then:

GPA = 0.2 x 4 + 0.4 x 3 + 0.25 x 2 + 0.15 x 1 = 2.65

Although the GPAs themselves are not published by the REF, it is a straightforward calculation to determine them from the published profiles and they are widely used in tables presenting the results.

In each case a separate set of profiles were produced under the following headings:

a) Research Outputs (publications etc.)

b) Research Impact (on the economy or society etc.)

c) Research Environment

d) Overall (weighted combination of Outputs (65%), Impact (20%) and Environment (15%))

In this appendix we will discuss the *Overall* results.

In total there were 36 Units of Assessment for the REF. Four of these were directly relevant to Engineering:

12 Aeronautical, Mechanical, Chemical and Manufacturing Engineering

13 Electrical and Electronic Engineering, Metallurgy and Materials

14 Civil and Construction Engineering

15 General Engineering

(ii) Position Relative to the UK

Some Institutions submitted their Engineering Research into one single UoA from the above list, while others divided their research into two or more UoAs with a separate submission for each. So to get an overall picture, it is possible to combine the results from the 4 Engineering UoAs for each Institution. This can be done by generating an average of the GPAs weighted by the number of FTE staff that were selected in each submission.

For example, Swansea University submitted to just one UoA in Engineering, with 74.83 FTE staff to UoA 15 and obtained an overall GPA of 3.29. Cardiff University submitted to two UoAs, with 14.30 FTE staff to UoA 14 and 33.80 FTE staff to UoA 15, obtaining overall GPAs of 3.44 and 3.31 respectively. Cardiff University thus submitted 48.10 FTE in total, with a combined overall GPA of (14.30 x 3.44 + 33.80 x 3.31)/48.10 = 3.35.

The same calculation can be applied to all the Institutions that submitted to at least one Engineering UoA to obtain the following table, which has been ranked by GPA score.

Combined Overall GPA scores for the 4 Engineering Units of Assessment

Institution	FTEs	GPA	Rank
University of Oxford	127.91	3.53	1
University of Cambridge	243.06	3.49	2
Imperial College London	344.10	3.38	3
King's College London	53.34	3.37	4
Cardiff University	48.10	3.35	5
University of Dundee	33.25	3.31	6
University of Bristol	123.38	3.30	7
Heriot-Watt University	108.84	3.30	7
University of Edinburgh	91.80	3.30	7
Swansea University	74.83	3.29	10
University of Southampton	276.48	3.25	11
University of Glasgow	84.00	3.25	12
University of Warwick	94.75	3.22	13
Queen Mary University of London	67.80	3.18	14
University of Exeter	44.00	3.18	15
University of Sheffield	200.80	3.18	16
University of Manchester	185.93	3.16	17

University of Nottingham	149.10	3.16	18
University College London	183.96	3.13	19
Cranfield University	156.70	3.10	20
Newcastle University	115.25	3.10	21
University of Leeds	141.00	3.09	22
University of Liverpool	58.00	3.09	23
Keele University	34.45	3.09	24
Nottingham Trent University	14.40	3.09	24
Lancaster University	24.98	3.08	26
University of Durham	34.00	3.08	26
University of Bath	81.50	3.07	28
University of Strathclyde	146.60	3.05	29
University of Surrey	138.09	3.04	30
University of Birmingham	126.90	3.01	31
Queen's University Belfast	116.95	3.00	32
University of Leicester	30.00	2.99	33
University of Sussex	14.00	2.97	34
University of Aberdeen	38.60	2.94	35
Open University	18.00	2.93	36
Loughborough University	196.90	2.93	37
University of York	22.30	2.91	38
Bangor University	12.60	2.89	39
University of Ulster	19.00	2.89	39
City University London	53.60	2.85	41
University of the West of England, Bristol	14.00	2.85	41
Aston University	47.63	2.85	43
University of Hull	14.90	2.82	44
University of Northumbria at Newcastle	23.00	2.80	45
University of Kent	24.00	2.78	46
University of Reading	17.20	2.76	47
University of Plymouth	25.00	2.75	48
Brunel University London	126.72	2.71	49
Manchester Metropolitan University	21.30	2.69	50
University of Brighton	8.50	2.67	51
University of Bradford	24.00	2.65	52
Teesside University	13.00	2.63	53
Coventry University	18.70	2.62	54
University of Bolton	14.00	2.60	55
London South Bank University	33.50	2.59	56
Robert Gordon University	14.00	2.58	57
Glyndŵr University	13.90	2.57	58
Oxford Brookes University	25.90	2.56	59
Sheffield Hallam University	31.20	2.55	60
University of Hertfordshire	14.80	2.52	61
University of Central Lancashire	19.60	2.52	62
Liverpool John Moores University	31.00	2.50	63

University of Greenwich	35.00	2.49	64
University of the West of Scotland	20.50	2.49	65
University of Salford	15.55	2.49	66
University of Huddersfield	34.80	2.48	67
University of South Wales	14.50	2.47	68
University of Portsmouth	18.00	2.46	69
Glasgow Caledonian University	21.00	2.40	70
University of Lincoln	12.00	2.40	70
Kingston University	14.00	2.32	72
Bournemouth University	24.80	2.31	73
De Montfort University	24.70	2.29	74
Anglia Ruskin University	8.00	2.28	75
Staffordshire University	8.40	2.26	76
University of Wolverhampton	12.00	2.20	77
Edinburgh Napier University	24.30	2.15	78
University of Abertay Dundee	14.20	2.08	79
University of East London	7.80	2.05	80
University of Northampton	6.75	2.03	81
University of Sunderland	12.25	2.03	81
University of Wales Trinity Saint David	5.00	1.75	83
University of Derby	13.00	1.67	84
Southampton Solent University	8.50	1.41	85

What is significant in the above table is the fact that Wales, with only 5% of the UK population, has two Universities (Cardiff and Swansea) ranked in the top 10 of the UK. In addition to this there are a number of other Welsh HEIs with niche areas of Engineering expertise.

(iii) REF Results for the Proposed ASTUTE 2020 Partners

Further details relating to the REF submissions and results for each partner institution are as follows. Note the term "Research Power" is obtained by multiplying the GPA by the FTE number of staff submitted.

a) Swansea University

Swansea University's College of Engineering made a single submission to the *General Engineering* Unit of Assessment (http://results.ref.ac.uk/Results/BySubmission/2337). This covered a total of 74.83 FTE academic staff spread across 11 different research groups as follows:

- Multidisciplinary Nanotechnology Centre
- Centre for Water Advanced Technologies Research
- Electronic Systems Design Centre
- Centre for Complex Fluid Processing
- Welsh Centre for Printing & Coating

- Institute of Structural Materials
- Advanced Materials and Process Modelling
- Corrosion & Functional Coatings
- Coastal Hydrology
- Aero - Structures
- Computational Mechanics

The results were as follows:

	% of the submission meeting the standard for:				
	4*	**3***	**2***	**1***	**U/C**
Overall	35	59	6	0	0
Outputs	16	74.2	9.1	0	0.7
Impact	55	45	0	0	0
Environment	90	10	0	0	0
Overall GPA = 3.29, Research Power = 246					

b) Cardiff University

Cardiff University made two separate submissions to Engineering. The first of these was to the *General Engineering* Unit of Assessment (http://results.ref.ac.uk/Results/BySubmission/1669). This covered a total of 33.80 FTE academic staff spread across 11 different research groups as follows:

- Biomedical Engineering
- Computational Mechanics
- Cardiff Centre for Research into Energy, Waste and Environment
- Centre for High Frequency Engineering
- High Value Manufacturing
- Medical Engineering and Medical Physics (MEMP)
- Centre for Renewable Energy Generation and Supply
- Mechanical and Structural Performance
- Tribology
- High Voltage Energy Systems
- Wolfson Centre for Magnetics

The results were as follows:

	% of the submission meeting the standard for:				
	4*	**3***	**2***	**1***	**U/C**

Overall	36	61	2	0	1
Outputs	18.8	76.7	3.6	0	0.9
Impact	80	20	0	0	0
Environment	55	45	0	0	0
Overall GPA = 3.31, Research Power = 112					

Ranked 5th in UK

The second Cardiff Engineering submission of these was to the *Civil and Construction Engineering* Unit of Assessment (http://results.ref.ac.uk/Results/BySubmission/1668). This covered a total of 14.30 FTE academic staff spread across 4 different research groups as follows:

- Geoenvironmental Research Centre (GRC)
- Hydroenvironmental Research Centre (HRC)
- Materials and Advanced Mechanics (MAM)
- BRE Centre for Sustainable Construction (BRESC)

The results were as follows:

	% of the submission meeting the standard for:				
	4*	**3***	**2***	**1***	**U/C**
Overall	47	50	3	0	0
Outputs	24.6	70.1	5.3	0	0
Impact	100	0	0	0	0
Environment	75	25	0	0	0
Overall GPA = 3.44, Research Power = 49					

Ranked 1st in UK

Also relevant here is the submission Cardiff University made to the *Business and Management Studies* Unit of Assessment (http://results.ref.ac.uk/Results/BySubmission/1672). This covered a total of 72.60 FTE academic staff.

The results were as follows:

	% of the submission meeting the standard for:				
	4*	**3***	**2***	**1***	**U/C**
Overall	43	43	13	1	0
Outputs	27.2	50.7	20.3	1.8	0

Impact	50	50	0	0	0
Environment	100	0	0	0	0
Overall GPA = 3.28, Research Power = 238					

Ranked 6th in UK, Cardiff University also made a submission to the *Clinical Medicine* Unit of Assessment (http://results.ref.ac.uk/Results/BySubmission/1661). This covered a total of 59.01 FTE academic staff spread across two research groups as follows:

- Institute of Cancer and Genetics
- Institute of Infection and Immunity

The results were as follows:

	% of the submission meeting the standard for:				
	4*	**3***	**2***	**1***	**U/C**
Overall	38	51	10	0	1
Outputs	33.3	53.4	11.3	0.4	1.6
Impact	80	20	0	0	0
Environment	0	87.5	12.5	0	0
Overall GPA = 3.25, Research Power = 192					

Ranked 8th in UK

In addition the submission Cardiff University made to the *Allied Health Professions, Dentistry, Nursing and Pharmacy* Unit of Assessment (http://results.ref.ac.uk/Results/BySubmission/1635) is also relevant. This covered a total of 74.95 FTE academic staff spread across six research groups as follows:

- Dentistry
- Healthcare Studies
- Institute of Molecular and Experimental Medicine
- Nursing & Midwifery Studies
- Optometry & Vision Sciences
- Pharmacy & Pharmaceutical Sciences

The results were as follows:

	% of the submission meeting the standard for:				
	4*	**3***	**2***	**1***	**U/C**
Overall	48	46	6	0	0
Outputs	23.1	67.2	9.7	0	0
Impact	90	10	0	0	0
Environment	100	0	0	0	0
Overall GPA = 3.42 , Research Power = 256					

Ranked 4th in UK

c) Aberystwyth University

Aberystwyth University will be contributing to ASTUTE 2020 through their Department of Computer Science. The University made a submission to the *Computer Science and Informatics* Unit of Assessment (http://results.ref.ac.uk/Results/BySubmission/2477). This covered a total of 24.80 FTE academic staff which was not divided into research groups.

The results were as follows:

	% of the submission meeting the standard for:				
	4*	**3***	**2***	**1***	**U/C**
Overall	21	53	24	2	0
Outputs	25.3	49.4	22.9	2.4	0
Impact	23.3	76.7	0	0	0
Environment	0	35	65	0	0
Overall GPA = 2.93, Research Power = 73					

d) University of Wales Trinity Saint David

The University of Wales Trinity Saint David made a single submission to the *General Engineering* Unit of Assessment (http://results.ref.ac.uk/Results/BySubmission/2225). This covered a total of 5.00 FTE academic staff which were not divided into research groups.

The results were as follows:

	% of the submission meeting the standard for:				
	4*	3*	2*	1*	U/C
Overall	0	3	69	28	0
Outputs	0	5.3	89.4	5.3	0
Impact	0	0	40	60	0
Environment	0	0	15	85	0
Overall GPA = 1.75 , Research Power = 9					

(iv) Summary

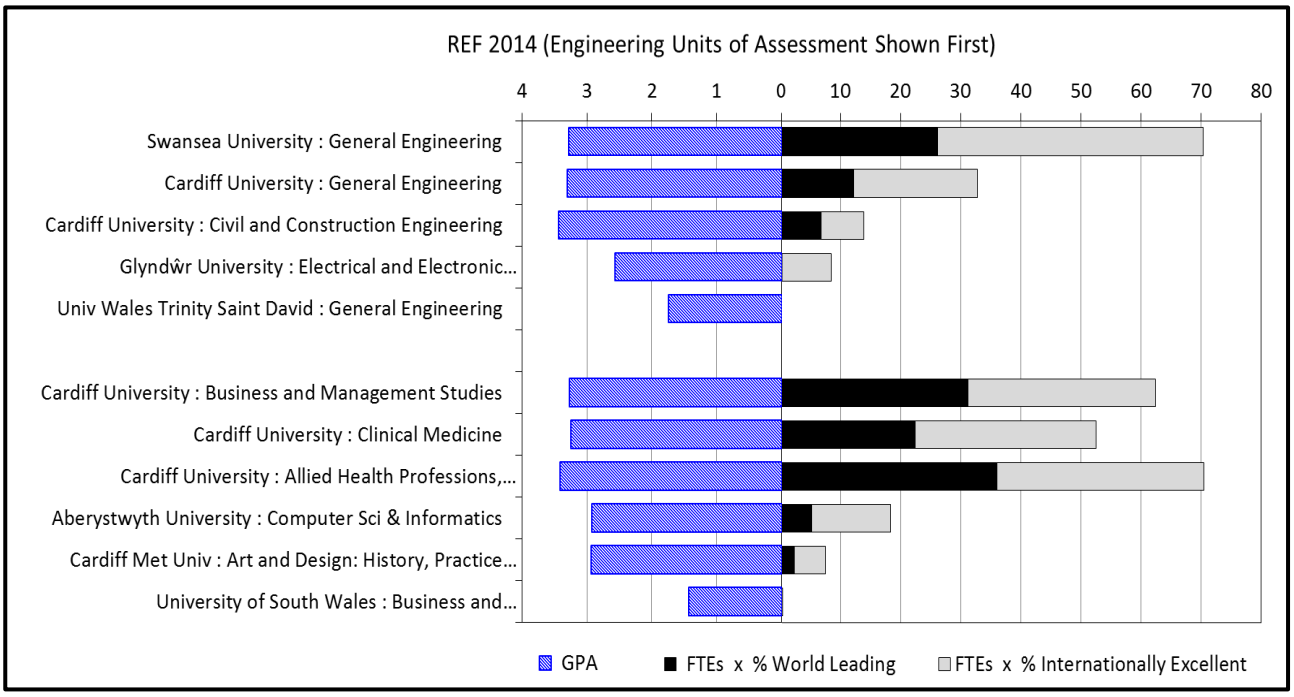
Clearly the foregoing discussion presents a substantial amount of data, but does demonstrate that there is a significant amount of World Leading and Internationally Excellent research within Wales that is relevant to manufacturing.

The best way to summarise this is via a combination of size and quality for each of the UoAs that will be relevant to ASTUTE 2020. The Research Power (GPA x FTE) is a useful measure in this respect and is presented in the following table. This groups the Engineering Units of Assessment first (as ASTUTE 2020 will be primarily based on Engineering expertise).

Institution	Unit of Assessment	FTE	World Leading (4*)	Internationally Excellent (3*)	GPA	Research Power
Swansea University	General Engineering	74.83	35%	59%	3.29	246
Cardiff University	General Engineering	33.80	36%	61%	3.31	112
Cardiff University	Civil and Construction Engineering	14.30	47%	50%	3.44	49
University of Wales Trinity Saint David	General Engineering	5.00	0%	3%	1.75	9
Cardiff University	Business and Management Studies	72.60	43%	43%	3.28	238
Cardiff University	Clinical Medicine	59.01	38%	51%	3.25	192
Cardiff University	Allied Health Professions, Dentistry, Nursing	74.95	48%	46%	3.42	256

	and Pharmacy					
Aberystwyth University	Computer Science & Informatics	24.80	21%	53%	2.93	73

Alternatively the figures for the number of FTE staff submitted to each UoA can be multiplied against the percentages of that submission meeting the World Leading (4*) and Internationally Excellent (3*) standards. This leads to a graphical representation in the figure below, which also includes the GPA values for each UoA.



Appendix II – Partner HEIs and their Adaptive Smart Specialisations

We present here a description of the partner HEIs and how their expertise fits in with the Adaptive Smart Specialisations.

(i) Swansea University

For the REF 2014 Swansea University achieved an outstanding results: "Among research-intensive institutions, Swansea University made the biggest leap, from joint 52nd position to joint 26th."[44]

Swansea University's contribution to the technical delivery of ASTUTE 2020 will be based in the College of Engineering. The research quality of the College of Engineering, was recognised in the 2014 Research Excellence Framework as being 35% "World Leading" and 59% "Internationally Excellent", placing it 10th overall in the UK as described in Appendix I. The College came second in "Research Environment". The REF also shows that 94% of research produced by engineering academic staff is of World-Leading (4*) or Internationally Excellent (3*) quality.

Further Evidence of the quality of Engineering at Swansea is demonstrated by the award of two Sêr Cymru appointments, Professor Andrew Barron and Professor James Durrant, to the College. The Welsh Government have committed up to £50 million to the Sêr Cymru programme to build research capability in Wales.

a) Track Record of Achievements in ASTUTE 2010 to 2015

The University's record in achieving the outputs and results specified for ASTUTE over the period 2010 to 2015 is demonstrated in the following table. This gives the share of the original targets for Swansea University (based on a 55% share of the technical delivery budget). Apart from the numbers of Enterprises Assisted (7 hours of assistance) all other targets had been achieved and significantly exceeded by 1st February 2015, five months before the end of the project.

	Original Target	Achieved by 1 Feb 2015	
Enterprises assisted	**192**	**122**	**64%**
Collaborative R&D	**22**	**69**	**314%**
Innovation centres and R&D facilities developed	**200 m^2**	**504 m^2**	**252%**
Gross Jobs created	**71**	**107**	**151%**
Enterprises Created	**3**	**8**	**267%**
Investment Induced	**£ 2.2 M**	**£ 5.4 M**	**245%**

[44] https://www.timeshighereducation.com/news/ref-2014-winners-who-performed-best/2017591.article

Products, processes or services registered	**22**	**29**	**132%**
New or improved products, processes or services launched	**66**	**184**	**279%**

It was pointed out in the Mid-Term Review that Enterprise Assists was not as important as others in terms of achieving economic benefit. Therefore we have not treated this as a priority and have instead concentrated on Collaborative R&D projects which have yielded an excellent level of results.

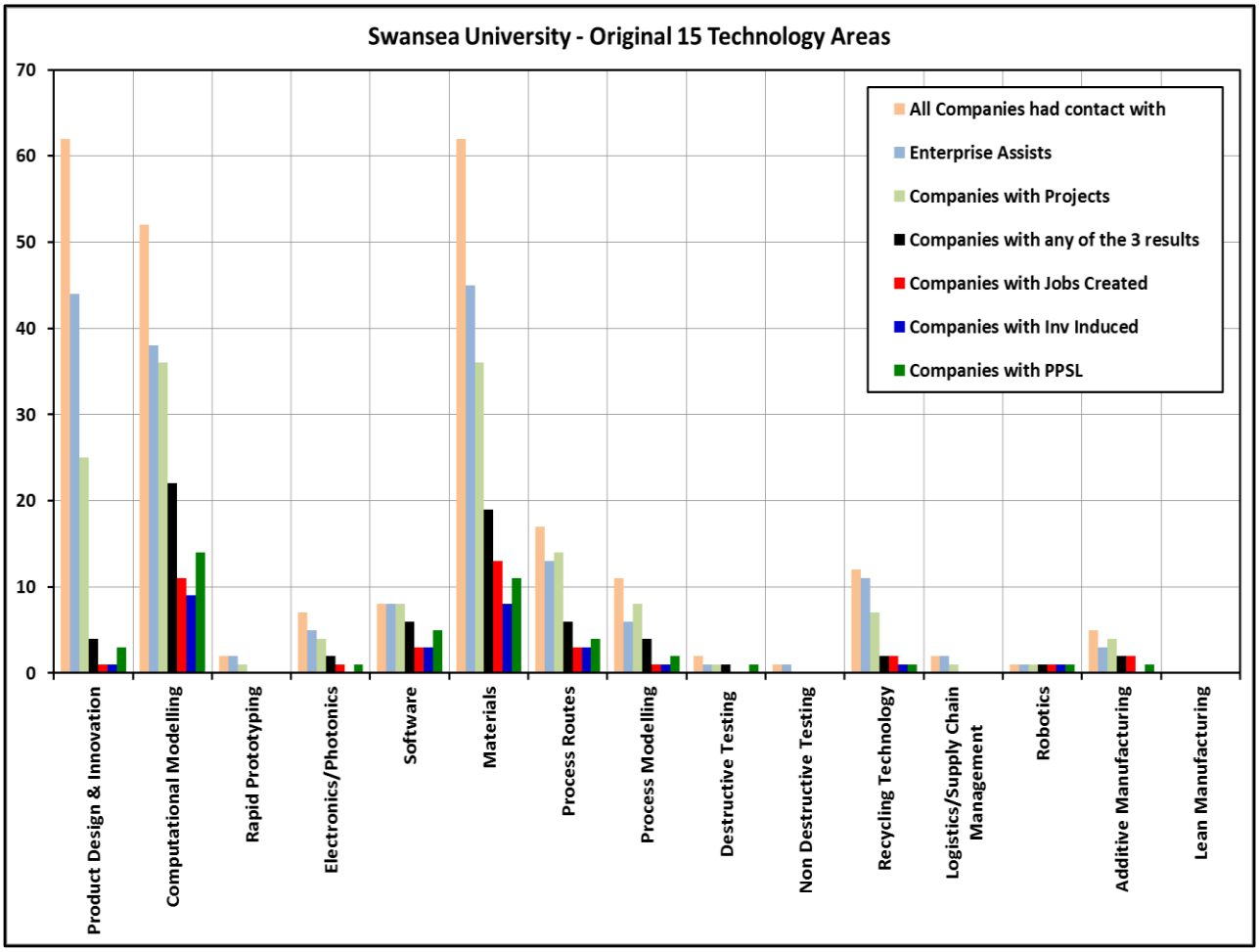
b) Industrial RD&I Demand

Recently we have conducted an analysis of the company interactions with Swansea University's ASTUTE team in terms of the 15 technology areas specified in the ASTUTE business plan in 2010. We have recorded where each technology area has been used for each company.

We have interacted with a large number of companies, some of these have proceeded to Enterprise Assists and some to full Projects. So it is useful to consider where each technology area has contributed to each of these to demonstrate demand.

In addition to evidencing demand, it is also possible to demonstrate where these technologies are having economic impact in terms of the 3 most important result indicators, (i) Jobs created, (ii) Investment Induced and (iii) New or Improved Products Processes and Services Launched (PPSL).

The following diagram presents the results of this analysis.



There are a number of useful observations that can be made from this graph:

- Product Design & Innovation has demonstrated high demand, with many enquiries, Enterprise Assists and Projects undertaken, but very little economic impact in terms of results. More detailed examination of the results shows that the demand in this area originated from very small embryonic companies and we are now inclined to steer away from this area in ASTUTE 2020.

- Computational Modelling and Materials have demonstrated high demand and the two areas with the greatest levels of economic impact in terms of jobs, investment and PPSL. Hence these two areas will be essential to form the basis for Swansea's contribution to the *Computational Engineering Modelling* and *Advanced Materials Technology* Adaptive Smart Specialisations.

- Some areas have shown modest demand and results, so these will not be a priority for Swansea in ASTUTE 2020 unless they are essential for one of the five defined Adaptive Smart Specialisations.

- A number of technology areas have shown near zero demand and impact. In many cases because we do not have these extensive specialisations at Swansea. So we will not aim to offer these as part of our Adaptive Smart Specialisations in ASTUTE 2020.

- The case of the Additive Manufacturing Technology area is interesting. This includes activities related to the ALM machine that was purchased during ASTUTE. Although demand and impact appear modest, because we only really commenced serious collaboration with local companies in the second half of ASTUTE. The results that have been achieved have occurred over the last 12 months or so and we can see a clear trend of growing demand and impact here. So this is another area that we feel is essential to include in ASTUTE 2020.

Therefore, based on the above discussion, our main contribution to ASTUTE 2020 will be in terms of the first two Adaptive Smart Specialisations, and these are dealt with in the following sub-sections.

c) Computational Engineering Modelling

Swansea University has an international reputation for the development of Computational Engineering Modelling. The Finite Element Method was developed here by Professor Olgierd Zienkiewicz in the 1960s and has now been adopted worldwide as a key Engineering analysis tool which has been incorporated into a range of standard software packages.

Examples of World Leading/Internationally Excellent impact case studies in the 2014 REF that are relevant to this specialisation include:

- ❖ Development and implementation of novel computational algorithms for finite element/discrete element analysis when applied to fracturing phenomena. This has been widely adopted in the mining industry to simulate explosive blasting operations. One case was cited where it enabled a cost saving over £1 Million for a single operation. This technique can also be used for more efficient development of manufactured goods that must withstand fracture. In this respect it has had a substantial commercial impact on the glass packaging sector, enabling significant weight reduction with annual cost savings of £70 Million and annual CO_2 emissions reduction of 0.5 Million tonnes[45].

- ❖ In the area of computational fluid dynamics (CFD), Swansea University researchers have developed a revolutionary system for aerodynamic design. Named "FLITE", this system uses Unstructured Mesh Technology and has been adopted by BAE systems, Airbus and many other aerospace companies. It has been used for the wing design of the Airbus A380, the world's largest passenger airliner, and the company acknowledges that it has thus supported "the many jobs involved in aircraft design and manufacture"[46].

- ❖ Multi-Physics Modelling Techniques. A research group at Swansea led by Professor Mark Cross has developed a simulation tool known as "PHYSICA" which can be used to

[45] The economic benefits of finite element/discrete element analysis when applied to industrial problems involving coupled field and multi-fracturing phenomena. REF impact case study http://results.ref.ac.uk/Submissions/Impact/2337
[46] Improved Aerodynamic Design Process for the Aerospace Industry through
Application of Unstructured Mesh Technology. REF impact case study http://results.ref.ac.uk/Submissions/Impact/2337

investigate multi-physics problems typically encountered in manufacturing and minerals extraction. This has been applied to predict flow in porous media that is encountered in the industrial "heap leaching" process where high value metals are extracted from particles of ore. It has enabled the many process variables to be optimised so that the yield of metal produced from the ore can be significantly increased. This enabled increased revenue of $58 Million over a year at one site alone in the quoted example[47].

In ASTUTE 2020 this Specialisation will be led by Professor David T. Gethin, the Deputy Director of the proposed ASTUTE 2020 operation.

The expertise available corresponds to the physical phenomena that occur during manufacturing. Among others these include:

- Modelling heat flow (e.g. appropriate to the hot forming of solid components and joining via welding etc.)
- Predicting the fluid flow of liquids and gases (relevant to e.g. the casting of liquid metal or injection moulding of plastics)
- Understanding the structural mechanics of solid objects (e.g. relevant to the strength and durability of manufactured components)

There have been several successful projects carried out under ASTUTE using these modelling techniques. Indeed, this is an area that transcends traditional boundaries between manufacturing industries. A good example is the discipline of computational fluid dynamics, (CFD) which has been used in ASTUTE to investigate blood flow in medical devices, flow of air through wind turbine blades, and the flow of molten metal at 1700°C in the casting of wear resistant advanced alloys. In investigating and improving additive layer manufacturing, computational methods were used for example to model the melting process of the metal powder and to simulate the gas flow in the build chamber.

Computational Engineering Modelling has played a key role to date in our ASTUTE projects with local companies and we see it as a critical specialisation for delivery in ASTUTE 2020.

d) Advanced Materials Technology

Swansea University has excellent strengths in Materials Technology, and the active research groups specified in the REF are

- Institute of Structural Materials
- Advanced Materials and Process Modelling
- Corrosion & Functional Coatings

[47] Advanced Simulation Technology to Optimise the Recovery of High Value Metals Through Heap Leaching. REF impact case study http://results.ref.ac.uk/Submissions/Impact/2337

This theme will be led by Professor Stephen G. R. Brown, the Head of the College of Engineering.

Examples of World Leading/Internationally Excellent impact case studies in the 2014 REF that are relevant to this specialisation include:

- Research into materials for Rolls Royce Gas Turbine Aero Engines has focussed on high temperature creep (gradual deformation under relatively constant mechanical stress) and fatigue (cyclical variations of mechanical stress). Safety critical titanium alloys and nickel-based superalloys have been studied in depth, using advanced mechanical testing rigs and high resolution microscopy, to characterise the mechanical properties of these materials. The case study highlights the fact that "The combined portfolio of research has delivered a reduction of 1% in specific fuel consumption, representing significant environmental and economic impact."[48]

- Collaboration with Tata Steel plants across Wales has enabled significant improvements in steel products to be achieved based on research into materials degradation via corrosion, and more effective coating solutions[49]. This has included improved high durability construction steels produced at Tata's Shotton works at Deeside, which now carry a 40 year corrosion warranty. Also Tata's *Cogent Power* Division in Newport, which manufactures electrical grade steels for use in transformers and motors, has benefitted from a new chromium free treatment developed at Swansea that enables compliance with new environmental legislation. The successful impacts of this research has now enabled a £20 Million Innovation and Knowledge Centre called "SPECIFIC" to be created at Baglan which will now investigate functional photo-voltaic coatings for electricity generation.

In the area of Advanced Materials Technology, collaboration with local companies has been extensive during ASTUTE. Successful, job-creating projects include the processing of high strength steels, high temperature cobalt alloys, lead free solders and composite tungsten alloys impregnated with diamonds for grinding aerospace components.

In terms of non-metallic composites and polymer materials we also see many opportunities to enable companies to develop enhanced materials and components. The use of composite materials offers a great number of advantages in terms of weight saving of components in the aerospace and automotive sectors. However companies do need considerable R&D help in integrating these materials which have complex, direction-dependent properties and require a step-change in processing knowledge, which is where Swansea's specialisations can make a significant contribution.

We also have extensive expertise and facilities for high-resolution optical and electron microscopy, so that for instance we can deduce phase transformations down to the atomic scale which have an impact on macroscopic behaviour of materials.

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[48] Rolls-Royce Gas Turbine Engines - Materials Characterisation to Underpin Design, Efficiency and Safe Service. REF impact case study http://results.ref.ac.uk/Submissions/Impact/2337

[49] The development of new coatings for Tata Steel Europe through collaborative research. REF impact case study http://results.ref.ac.uk/Submissions/Impact/2337

e) Manufacturing Systems Engineering

It is anticipated that Swansea will have a smaller input in this area; there are a number of academics who can contribute, across several research groups in the College of Engineering, specifically aimed at cyberphysical systems and big data related solutions for manufacturing.

f) Multidisciplinary Application of Adaptive Smart Specialisations

These three Adaptive Smart Specialisations are essential to support collaborative research with industry on specific topics, but they are also underpinning specific issues in a wide range of activities. Frequently, there will also be aspects from more than one Smart Specialisation needed to move a manufacturing process forward or to address a specific topic of interest to industry.

Additive Layer Manufacturing (ALM) is one such topic. ALM can be considered as sophisticated variants of 3D printing where three dimensional components can be built up from very thin layers of material. This opens the route to manufacture complex free-form engineering components at the metre scale. The digital nature of the process allows fabrication of parts that cannot be fabricated by other processes making efficient use of materials such as advanced alloys that are often expensive. However, the process is not technically mature, design rules for this process have not been established and application requires significant research input to achieve a successful result. There are numerous research challenges around the process and the materials especially when processing metals. ASTUTE 2020 can support further development of this innovative manufacturing process using its expertise from the areas of Advanced Materials Technology and Computational Engineering Modelling. Swansea's expertise in these Adaptive Smart Specialisations will enable extensive collaborative research in this area.

Another example of cross-smart specialisation work is smart manufacturing. It will cover cyberphysical systems, simulation, 3D visualisation, sensor technology, data collection, analytics, decentralised decisions and monitoring physical processes including remote operation and intelligent and knowledge-based systems within modular structured Smart Factories. . Swansea will be able to contribute to this in under Computational Engineering Modelling and Manufacturing Systems Engineering.

(ii) Cardiff University

Cardiff University was rated 5th in the UK in the 2014 Research Excellence Framework (REF) based on the quality of its research, with an overall Grade Point Average (GPA) of 3.27, confirming its place as a world-leading university. Cardiff University has risen 17 places on the quality measure since 2008, making it the fastest rising amongst the leading research universities of the Russell Group. For the first time the Funding Councils have sought to measure the impact of University research, and again Cardiff University has performed outstandingly on this indicator, ranked 2nd in the UK. An impressive 87% of Cardiff University's research was assessed as world-leading or internationally excellent.

Cardiff University's elements of ASTUTE2020 will be delivered by an established partnership made up of three distinct research groupings, each of which has an international reputation for

excellence in its own right, these being, in descending order of their expected contribution and consequent proportion of project resources:

- The Mechanics, Materials and Advanced Manufacturing Theme within Cardiff University School of Engineering (60%)
- The Logistics and Operations Management Section of Cardiff Business School (30%)
- Cardiff University College of Biomedical and Life Sciences (10%) (Clinical Innovation Hub in the School of Medicine)

These three groupings between them are represented by four REF2014 Units of Assessment (UoAs), each of which has direct relevance to the identified Smart Specialisation areas that will be delivered through ASTUTE2020. As can be seen below, through our excellent performance in each of these UoAs, Cardiff University has again demonstrated its world class credentials, as detailed below:

The Mechanics, Materials and Advanced Manufacturing Theme within Cardiff University School of Engineering

Associated REF2015 Unit of Assessment: UoA15 - General Engineering

Research in this area is led in ASTUTE2020 by Academic Co-Director and Cardiff ASTUTE 2020 Lead Investigator Professor Rossi Setchi, Director of the Mechanics, Materials and Advanced Manufacturing Theme, Co-Director of the Centre for Advanced Manufacturing Systems at Cardiff (CAMSAC) and leader of the High Value Manufacturing and Knowledge Engineering Systems research groups within Cardiff University School of Engineering.

The positive impact that research at Cardiff University within this UoA has had on the environment, the economy, employment and healthcare is reflected in its GPA score of 3.31 and rank of joint 7th in the UK. 97% of Cardiff University research in this UoA was assessed as world-leading or internationally excellent, while 80% of Cardiff's impact case studies in this UoA were deemed 'outstanding' (4*) for their impact in terms of their reach and significance, ranking Cardiff top in the UK.

The Logistics and Operations Management Section of Cardiff Business School

Associated REF2015 Unit of Assessment: UoA19 - Business and Management Studies

Research in this area is led in ASTUTE 2020 by Academic Co-Director Mo Naim, Deputy Dean of Cardiff Business School and Co-Director of the Centre for Advanced Manufacturing Systems at Cardiff (CAMSAC)

Cardiff Business School was ranked 6th in the UK for the quality of its research in the 2014 Research Excellence Framework (REF) with a GPA of 3.28. Only 'Golden Triangle' (Oxbridge and London) schools were placed higher among more than 100 business schools in the UK. With this result, Cardiff becomes one of only two business schools in the UK to be ranked in the top ten in each of the Government's five assessment exercises since 1992. 86% of Cardiff University research

in this UoA was assessed as world-leading or internationally excellent with the School's research environment being rated the highest among UK business schools.

Cardiff University College of Biomedical and Life Sciences (Clinical Innovation Hub and the Institute of Translation, Innovation, Methodology & Engagement in the School of Medicine)

Associated REF2015 Units of Assessment: UoA1 Clinical Medicine & UoA3 - Allied Health Professions, Dentistry, Nursing and Pharmacy

Research in these areas is led in ASTUTE2020 by Academic Co-Director Professor Ian Weeks, Dean of Clinical Innovation, Director of the Institute of Translation, Innovation, Methodology & Engagement at Cardiff University School of Medicine and Chairman of Cardiff University Central Biotechnology Services (CBS).

Clinical Medicine was ranked 8th in the UK on quality (GPA 3.25) with 89% of the research submitted being classed as of a world-leading or internationally excellent quality. With respect to research impact, 80% of Cardiff's submission in this UoA was deemed 'outstanding' (4*) for its impact in terms of its reach and significance.

Allied Health Professions, Dentistry, Nursing and Pharmacy at Cardiff University was ranked joint 4th in the UK on quality (GPA 3.42), with 94% of the research submitted being classed as of a world-leading or internationally excellent quality. With respect to research impact, 90% of Cardiff's submission in this UoA was deemed 'outstanding' (4*) for its impact in terms of its reach and significance.

Cardiff University and the Smart Specialisation Themes

Focusing on the three areas highlighted above, Cardiff University will provide manufacturing companies with access to proven world class expertise and facilities across all three of the identified Adaptive Smart Specialisation Themes as summarised in the Table below.

Adaptive Smart Specialisation	**Computational Engineering Modelling and Simulation**	**Advanced Materials Technology**	**Manufacturing Systems Engineering**
Cardiff Theme Lead	RS	RS	MN
Deputy Theme Lead	MN	IW	RS IW
Mechanics, Materials and Advanced Manufacturing Theme (UoA15)	X	X	X
Logistics and Operations Management Section (UoA 19)	X		X
School of Medicine Institute of Translation, Innovation, Methodology & Engagement (UoA 3)		X	X

Academic Co-Directors: RS- Prof Rossi Setchi, MN - Prof Mo Naim, IW – Prof Ian Weeks

Mechanics, Materials and Advanced Manufacturing Theme (UoA15)

The Mechanics, Materials and Advanced Manufacturing Theme comprises the largest research section in the School of Engineering, itself the largest School within the College of Physical Sciences and Engineering. The theme is led by Professor Rossi Setchi, who will also be the Lead Investigator for Cardiff University's elements of the ASTUTE 2020 project on behalf of Cardiff. The Theme encompasses several further research specialisations:

• Advanced Manufacturing (incl. micro, nano and additive manufacturing)

• Advanced Materials

• Aerospace

• Computational Mechanics

• Intelligent Systems

• Mechanical and Structural Performance

• Transport

• Tribology and Contact Mechanics

This research theme incorporates cutting edge research, which fosters innovation and sustainability, supports social and economic development, and contributes to improvements in health and quality of life. The research work conducted under this theme develops, validates and verifies reliable models alongside robust, accurate and efficient simulation tools to describe and understand complex non-linear systems, both natural and engineered, on a wide range of spatial and temporal scales, with an emphasis on advanced materials and structures. The research also focusses on the development of innovative, advanced and environmentally friendly technology, together with its effective and sustainable implementation via suitable hardware, software or management systems to applications within the transport, energy generation and manufacturing industries.

The theme's strategic priorities include sustainable manufacturing and product life cycle management; intelligent manufacturing and design informatics; autonomous structural health monitoring; improving understanding of advanced materials through computational and experimental approaches; soft materials; ICT tools for decision support; micro/nano technologies; high value manufacturing; symbiotic human-robot interaction; prognostics and smart systems.

Close involvement with industry ensures that the research has both relevance and meaning. This focus on applied research enables us to work with some of the world's most renowned global engineering companies, whilst also contributing to the needs of the local region.

Research is conducted within a vibrant environment, which includes world-class laboratories in additive layer manufacturing, micro/nano manufacturing, metrology, tribology and structural performance.

Drawing on the wide ranging expertise from across the theme and its constituent research groups, Mechanics, Materials and Advanced Manufacturing Them**e** will contribute to all three of the identified Adaptive Smart Specialisation areas as detailed below:

Computational Engineering Modelling and Simulation

Cardiff School of Engineering carries out internationally recognised research in the area of Computational Mechanics. This important area of engineering involves the use of computer models to understand real-world materials and processes.

Researchers develop and apply numerical and computational models to advanced materials, structures and processes to improve their efficiency, efficacy and economy. These models are then implemented using high performance computational strategies based on extended finite element methods, hybrid crack elements, meshless methods and multi-scale modelling techniques employing smooth particle hydrodynamics and lattice simulations.

In collaboration with NASA and Airbus, analysis and optimum design software (VICONOPT and BUNVIS-RG) has been developed for investigation of stiffened wing and fuselage panels, and also for lightweight 3-dimensional frame structures for space applications. VICONOPT is being

extended for use in the preliminary design of aerospace structures with particular emphasis on the post buckling analysis of stiffened panels made from carbon fibre composite materials, modelling of damage in composite materials, multi-level optimisation and modelling for uncertainty in material properties, structural dimensions and loads.

Researchers working in computational mechanics are looking at the mechanics of a range of advanced materials, including composites, nanostructured materials, self-healing cement-based materials, and metallic foams. A particular strength is the development and analysis of novel self-healing materials, as well as constitutive models for concrete and high performance fibre reinforced cementitious composites and their implementation in finite element codes (especially in the commercial code LUSAS).

Computational mechanics also has a significant role to play in biomedical science and engineering. Engineers in Cardiff School of Engineering have been involved in a research project into haptic feedback in surgical simulation. Experts in computational mechanics from Cardiff University are working together with mathematicians, computer scientists and clinicians from France and Australia to create highly accurate surgical simulators for the training of surgeons.

Advanced Materials Technology

The emphasis of research into advanced materials at Cardiff School of Engineering is on understanding and predicting how the internal microstructure of an engineering material influences its response when applied in the field.

Researchers in the School specialise in various materials including nanostructured materials, metals, polymeric, metallic and cement-based composites, quasi-brittle materials (such as concrete and ceramics), soft materials such as foams, and tissues such as skin. Their expertise is applied to research projects that range from exploring micromechanical principles to large scale tests on real components.

To support research activities in advanced materials, the School has developed and invested in state-of-the-art techniques and facilities, including:

- Processing (e.g. composite manufacturing, deposition of thin films of new electronic and magnetic materials by pulsed laser ablation)
- Micromachining (e.g. femtosecond laser etching of microfluidic circuits)
- Characterisation (e.g. mechanical testing, magnetic and thermoelectric properties)
- Theory and Modelling (e.g. mechanical properties of nanostructured composites)
- Non-destructive Testing (e.g. acoustic emission of aerospace components, microwave spectroscopy)
- Applications (e.g. textured insulators for high voltage systems, aerospace materials, new types of orthopaedic implants)

The research has various applications from medicine, such as developing new bone cements, to developing stronger, lighter materials for aerospace components.

A key research interest within advanced manufacturing is the development of micro- and nano-

fabrication processes. This has been listed as one of the priority areas in the UK Technology Strategy which maintains the importance of development and exploitation of key emerging technologies, and also development of 'innovation platforms'.

Another key area of research is additive layer manufacturing. It encompasses a range of activities including the development of new materials with tailored properties, exploiting current technologies in new applications, and investigating the sustainability aspects of additive layer manufacturing technologies, such as the recyclability of the powders used. Design for additive layer manufacturing is also an area of active research.

Our focus in the area of sustainable design and manufacturing is on the development of sustainable products, and efficient and sustainable manufacturing processes. It also includes the development of sustainable manufacturing systems and enterprises. Furthermore, our ambition is to promote the use of intelligent decision support for sustainable manufacturing and product life cycle management, and the development of advanced information and knowledge-based systems which deliver industrial sustainability.

Within this area, we also develop advanced machine learning tools and information methodologies for next-generation manufacturing technologies, processes and systems

Logistics and Operations Management (UoA19)

Cardiff Business School is the largest school in the College of Arts, Humanities and Social Science. The Logistics and Operations Management (LOM) section within the Business School is an interdisciplinary group of academics, with backgrounds in engineering, mathematics, economics, geography, law, management and psychology. Professor Mohamed Naim, Deputy Dean of the Business School has been the lead Cardiff University investigator on the current ASTUTE project and will be a Co-Director of ASTUTE 2020.

The Logistics and Operations Section is one of the world's largest and foremost groupings of academic staff in this subject area and is highly active in terms of research output, postgraduate teaching, and postgraduate research. A number of specialist Research Groups and Units of direct relevance to ASTUTE2020 are to be found within the Section, including the Logistics Systems Dynamics Group (LSDG) and the Centre for Automotive Industry Research (CAIR), while the section also acts as the operational hub for the multidisciplinary Centre for Advanced Manufacturing Systems At Cardiff (CAMSAC), a virtual centre which brings together manufacturing related researchers from across the University. The Section maintains a highly active Advisory Group made up of senior representatives from industry, government and a range of other relevant stakeholders which ensures that research and teaching within the Section is highly relevant to practice.

For the ASTUTE 2020 project, it is envisaged that the LOM section will primarily provide specialist world class expertise in three of the identified Smart Specialisation Themes, including:

Computational Engineering Modelling and Simulation

The LOM section has specific world leading expertise in a number of highly industrially relevant areas within this theme, including:

- Statistical forecasting methodologies
- Optimisation including multi-objective optimisation
- Development and supplication of advanced algorithms
- Linear and non-linear control theory
- Discrete, continuous and discrete event simulation

Manufacturing Systems Engineering

LOM Section activity within this theme will encompass a number of areas aimed at helping companies develop and improve their manufacturing systems and will range from internal business processes to processes operating across whole supply chains and networks. Specific areas of expertise that will be brought to bear in this respect will include:

- Supply chain re-engineering
- Operational excellence
- Manufacturing process improvement
- Failure modes effects analysis
- Sustainable manufacturing and the circular economy
- Sales, demand and supply chain forecasting
- Inventory management
- Production planning and control

Cardiff University College of Biomedical and Life Sciences (Clinical Innovation Hub and the Institute of Translation, Innovation, Methodology & Engagement in the School of Medicine)

Research in the School of Medicine and the wider College of Biomedical and Life Sciences is focused on interdisciplinary themes. Each of these spans the spectrum from laboratory investigation to clinical practice, in both hospital and community settings. This approach is the key to its research strength and achievements.

The Institute of Translation, Innovation, Methodology and Engagement (TIME) of which Professor Ian Weeks is Director, provides the infrastructure, environment and support to drive clinical translational and innovation opportunities for the School of Medicine. Specific areas of current activity relevant to the ASTUTE 2020 Smart Specialisation themes include:

Advanced Materials Technology

- Use of novel materials in the research and development of novel *in vitro* diagnostic methods for a variety of pathologies including infection, inflammation and cancer and the subsequent development of point of care diagnostic equipment utilising these methods.

The overarching strategic model for the research is to target areas where there is an unmet clinical need or where synergy of technologies can enhance clinical diagnosis and management of

underlying pathologies. Such a strategy is beneficial to patients and cost-effective for the healthcare provider.

Cardiff Medical School and the College of Biomedical and Life Sciences are also presently establishing a Clinical Innovation Hub that will encourage and support academics to develop innovations in the healthcare arena for patient and health economic benefit. This will provide an environment and ethos for groups with a healthcare interest across Cardiff University to build relationships between themselves, with the NHS, other healthcare providers and industry. This will not only lead to health improvement but will also result in wealth creation and its associated socio-economic benefits.

It is envisaged that ASTUTE 2020 will also have access to the facilities of Central Biotechnology Services (http://centralbioserv.co.uk), of which Professor Weeks is Chairman. This is a state of the art ISO9001 accredited facility that offers access to expertise, facilities and associated technologist support for activities within the life science sector. This services both university and commercial clients and is accessible directly through the School/College or through its presence in the Welsh Government Life Sciences Hub.

(iii) Aberystwyth University

a) Expertise and Track Record

Aberystwyth University's contribution to the technical delivery of ASTUTE 2020 will be based in the Department of Computer Science. The Department was ranked 11th in the UK for Research Intensity in the 2014 REF exercise, and the emphasis of its research is on Intelligent Systems, including its application to Design and Manufacturing.

One of Aberystwyth University's Impact Case studies in this area has been selected for publication by the relevant REF panel as a key exemplar of the impact of Computer Science research in the UK. It concerns the automated analysis of car system designs in order to identify potential problems in manufactured systems and to support maintenance. The software produced during the research has been commercialized and is deployed in some 200 vehicle producers and Tier 1 suppliers around the world.

On ASTUTE 2010-2015, Aberystwyth University worked with manufacturing companies to automate processes with software, making companies leaner and more competitive. One example of this was the work done with printing companies in Wales, where better monitoring and reporting of manufacturing problems enabled companies to improve productivity by reduce downtime. Aberystwyth University also provided specialised software support to engineering projects run by other partners within ASTUTE 2010-2015, such as its work with Swansea University on a project to monitor medical cleanliness that resulted in a new company being formed.

b) Area of Contribution to ASTUTE 2020 and industrial demand

Aberystwyth University will contribute to ASTUTE 2020 in the Smart Specialization area of

Manufacturing Systems Engineering. In particular, its contribution will concentrate on its strengths in Intelligent Software, and focus on Operational Excellence, on Manufacturing Process Improvement and on Production and Inventory Control.

Much of the potential for improving the competitiveness of Welsh Manufacturing Industry lies in the collection, analysis and exploitation of data about manufacturing performance. The twin trends of cloud computing and analysis of big data can be exploited to provide companies with a much more detailed understanding of the strengths and weaknesses of their performance, and that understanding can be used to improve performance. Aberystwyth University will work with WWV Manufacturing Companies to educate them about the potential of software to improve their competitiveness, and through collaborative projects, will support them in achieving the potential benefits.

(iv) University of Wales Trinity Saint David (UWTSD)

UWTSD will contribute to ASTUTE 2020 in the field of Non Destructive Testing under the Adaptive Smart Specialisation of Computational Engineering Modelling.

Principally, UWTSD will apply and develop NDT techniques in partnership with companies to characterise the performance of materials and components relevant to the Welsh manufacturing sector. Currently UWTSD runs the UK's only MSc in NDT. UWTSD will build on its strengths in the following specific areas:

- Ultrasonic: Dr Charlton's work in partnership with TWI has led to significantly improved real-time acquisition and processing of scanned Ultrasonic measurements, including new analytical methods for improved resolution of buried defects. Two successful PhD completions in this area and numerous publications. Further collaborative projects identified with Oceaneering Ltd and Silverwing Ltd. Applications extend to wider manufacturing sector, including development of Full- Matrix Capture technique.
- Magnetic Flux leakage: Collaborative project with Silverwing Ltd planned for improved inspection of steel tanks. Builds on successful industry-based PhD project.
- Thermography: Building on successful PhD projects led by Prof Donne in collaboration with United Aerospace Ltd (EPSRC CASE Studentship) and TWI Ltd, this area will utilise our expertise and resources in high-speed thermography and also stress detection using the lock-in thermo-elastic approach. Defect detection in novel composite material components is a particular strength. In addition, high frame-rate thermography will be applied to optoelectronic devices, where industrial collaborations have been agreed with two local companies that manufacture in Wales.
- Laser Doppler Scanning Vibrometry - for non-contact vibrational analysis. Projects identified with local companies.

Relevant publications include:

1. Directivity Investigation of two Annular Phased Array Transducers", G. Liaptsis, P. Charlton and D. Liaptsis, The e-Journal of NDT, ndt.net, Vol. 20 No.4 April 2015.

2. “Focal Law Calculations for Annular Phased Array Transducers”, G. Liaptsis, P. Charlton, D. Liaptsis and B. Wright, The e-Journal of NDT, ndt.net, Vol. 20 No.2 February 2015.

3. “Ultrasonic Evaluation of Artificial Kissing Bonds in CFRP Composites”, M. Wood, P. Charlton and D. Yan, The e-Journal of NDT, ndt.net, Vol. 19 No.12 December 2014.

4. “Demonstration of a Novel Equation for the Near Field Distance Calculation for Annular Phased Array Transducers”, G. Liaptsis, P. Charlton and D. Liaptsis, The e-Journal of NDT, ndt.net, Vol. 19 No.11 November 2014.

5. “Quantitative Analysis of Big End Journal Form and Bolt Installation using Ultrasonic Time of Flight Measurements”, W. Perry, P. Charlton and M. McDonald, The e-Journal of NDT, ndt.net, Vol. 19 No.10 October 2014.

6. “Multiple Virtual Source Aperture Imaging for Non Destructive Testing”, M. Sutcliffe, P. Charlton and M. Weston. Insight (British Journal of NDT), Vol. 56 No2 February 2014.

7. "Full matrix capture with time efficient auto focusing of unknown geometry through dual-layered media", M. Sutcliffe, M. Weston, P. Charlton, I. Cooper and K. Donne. Insight (British Journal of NDT), Vol. 55 No6 June 2013.

8. ‘A Modified Synthetic Aperture Focussing Technique Utilising the Spatial Impulse Response of the Ultrasound Transducer’, S. A. Mosey, P. Charlton and I. Wells, The e-Journal of NDT, ndt.net, Vol. 18 No.03, March 2013.

9. ‘Resolution enhancement of ultrasonic B-mode images’, S. A. Mosey, P. Charlton and I. Wells, Insight (British Journal of NDT) Vol. 55 No2 February 2013.

10. ‘Real-time full matrix capture for ultrasonic non-destructive testing with acceleration of post-processing through graphic hardware’, M. Sutcliffe, M. Weston, B. Dutton, P. Charlton and K. Donne. NDT&E International Vol. 51, October 2012.

11. ‘Virtual source aperture imaging for non-destructive testing’, with M. Sutcliffe, M. Weston, P. Charlton , B. Dutton and K. Donne. Insight (British Journal of NDT) Vol. 54 No 7 July 2012.

12. ‘Focusing of ultrasonic data for lateral defect positioning in time of flight diffraction’, P. Sinker, P. Charlton and K. Donne. NDT 2009, 48th Annual British Conference on NDT, August 2009.

13. Emerson R, Ash C, Town G, Donne K, Omi T, and Daniel G “Pigmentation: selective photothermolysis or non-specific skin necrosis using different intense pulsed light systems?” Journal of Cosmetic and Laser Therapy June 2013, Vol. 15, No. 3 , Pages 133-142 (doi:10.3109/14764172.2012.758381)

14. Donne K E , Marotin A and Al-Hussany A :" Dual Reciprocity Boundary Element Modelling of Collimated Light Fluence Distribution in Normal and Cancerous Prostate Tissue during Photodynamic Therapy" BIOMED, April 2013 Budapest, Hungary

15. Ash C, Donne K, Daniel G, Town G, Clement M, Valentine R. 'Mathematical modelling of

the optimum pulse structure for safe and effective photo epilation using broadband pulsed light'. J Appl Clin Med Phys 2012; 13:5:3702. doi: 10.1120/jacmp.v13i5.3702

16. Donne K E, Marotin A, Al-Hussany A: "Modified dual reciprocity boundary element modeling of collimated light fluence distribution in normal and cancerous prostate tissue during photodynamic therapy" 34th International Conference on Boundary Elements and other Mesh Reduction Methods, Split, Croatia, June 2012

17. P. Curnick, R.D. Thomas, P Charlton and K.E. Donne. 'An investigation into the drilling of carbon and glass fibre reinforced polymer composites', Eighth International Conference on Condition Monitoring and Machinery Failure Prevention Technologies, June 2011

18. Donne K E, Marotin A, Al-Hussany A and Daniel G M "Modified Boundary Element Method to Model Radiative Transport in Biological Tissue" International Journal of Engineering Simulation , vol12, No 1, (March 2011)

19. Ash C, Donne K, Daniel G, Town G & Clement R "How Safe Are Home-Use Intense Pulsed Light (Ipl) Devices?" LASER Europe 2010, Tarragona, Spain, May 2010

20. Sinker P , Donne K "A finite-difference time-domain model for dynamic focusing in time of flight diffraction" 7th International Conference Quality Reliability Maintenance, Swansea, UK, April, 2010.

21. Lake K. et al,. 'The influence of compliant chassis components on motorcycle dynamics', Vehicle System Dynamics: International Journal of Vehicle Mechanics and Mobility, 50, Issue 7, 2012.

22. Williams. O., Oseng. T., et al.' The application of lean thinking to the Prototype Design and Manufacture of Motorsport Composite Structures' 13th International Conference on Modern Information Technology in the Innovation Processes of industrial enterprises, MITIP 2011.

23. Oseng. T., Williams. O., et al. 'Quality Implications of Concept Design to Prototype Manufacture of a Low Cost Automotive Panel – A Case Study'. 7th International Conference, Quality Reliability and maintenance. QRM 2010.

Appendix III – Beneficiary and Stakeholder Engagement

The following tables list contacts for ASTUTE 2020's joint beneficiaries and stakeholders that have been engaged in discussions on how to shape the operation over the last few months (as of 27/02/16). It has to be emphasized that further discussions will take place as the operation develops.

Joint Beneficiary	Contact
Aberystwyth University	Prof Chris Price
Cardiff University	Prof Mo Naim, Prof Rossi Setchi, Prof Ian Weeks
University of Wales Trinity Saint David	Prof Kelvin Donne, Dr Stephen Hole

Organisation	Contact
Welsh Government	David Rosser, [ ]
WG Smart Initiatives	[ ], Innovation Specialist Team, [ ]
Industry Wales	Tom Whyatt [ ]
Cardiff Capital Region Board	[ ] Cardiff Capital-Region Support Unit
North Wales Economic Ambition Board	[ ] Regional Skills & Employment
Swansea Bay City Region	Pillar 3 CAPITAL - European & other funding sources: [ ]
Welsh Opto Electronics Forum	Chairman Prof Andy Evans
TWI	[ ]
Tata	[ ]
The Manufacturers' Organisation EEF	[ ]
HSSMI	Simon Barnes, Leslie Lee
Catapult	Dick Elsy, Paul John, Ian Collier, Sir Jim McDonald, [ ]
Fraunhofer UK	Simon Andrews

[Information Redacted in above table - section 40 (2)]

A large number of organisations would welcome ASTUTE 2020 being funded in the next round of Structural Funds to further support them through targeted, collaborative research. They have all provided written letters of support which are provided in a separate Appendix due to file size restrictions. It has to be emphasized that this list is non-exhaustive and is only an indication of the demand for ASTUTE 2020.

Appendix IV – Communication with Regional Learning Partnership

From: Rhianydd Herdman [mailto:RHerdman@carmarthenshire.gov.uk]
Sent: 13 May 2015 13:20
To: info@astutewales.com
Subject: Regional Learning Partnership South West & Central Wales - Project Feedback

Message sent on behalf of Elid Morris, RLP Manager

With reference to the development of the Regional Delivery Plan for Employment and Skills for south west and central Wales, the RLP is currently undertaking a process to review proposed projects which will have an impact on it.

As part of the process, it was agreed by the RLP Strategy Group to review projects that were either at OLT or Business Planning Stage in relation to **ERDF** funding and provide feedback to WEFO as to the strategic fit (aligned to the evidence base) and if there is support from the partnership for the project.

This communication is to advise you that following this review, feedback has been provided to WEFO to advise that your project **'ASTUTE 2020 (Advanced Sustainable Manufacturing Technologies)'** has the support of the RLP and there is a strategic fit with the Regional Delivery Plan. Comments provided to WEFO were as follows:-

There is a strategic fit with the Regional Delivery Plan and the organisation has engaged with the RLP.

If you have any queries, please do not hesitate to contact the RLP.

Kind regards

Elid Morris
Manager
Rheolwr
Regional Learning Partnership - South West & Central Wales
Partneriaeth Ddysgu Ranbarthol – De Orllewin a Canolbarth Cymru
Llanelli Town Hall, Town Hall Square, Llanelli, SA15 3AH
Ffôn - Phone: 01554 742431
Symudol - Mobile: 07789 371211
E-bost ~ E-Mail emorris@carmarthenshire.gov.uk
www.rlp.org.uk

Appendix V – Communication with FLEXIS

From: Robert Francis [mailto:robert.francis0@tiscali.co.uk]
Sent: 21 May 2015 09:46
To: Sienz J.
Cc: Heuberger A.; Hywel Thomas; Lee Hosking
Subject: Engagement between FLEXIS and ASTUTE

Dear Prof Sienz,

It was good to meet up with you and Anke on Monday, and again yesterday with Prof Thomas at the Swansea Bay City Region Innovation Summit.

Having exchanged information regarding the ASTUTE and FLEXIS operations that are currently going through business planning with WEFO, I think we can safely conclude as a result of these discussions, that the two operations do not conflict with each other in any way.

My summary of our meeting was as follows:

FLEXIS is a pan-Wales operation, being submitted to the 2014-2020 Programme, Priority Axis 1: Research and Innovation, and will contribute towards the Programme's specific objective **SO 1.1; 'To increase the success of Welsh research institutions in attracting competitive and private research funding**'.

ASTUTE is a pan-Wales operation, being submitted to the 2014-2020 Programme, Priority Axis 1: Research and Innovation, and will contribute towards the Programme's specific objective SO 1.2; " **To increase the number of Welsh SMEs undertaking innovation, supporting a growth in productivity**".

FLEXIS will focus on the development of an energy systems research capability in Wales, whereas ASTUTE will focus on manufacturing.

It can be seen from the above therefore, that the two operations do not conflict, either in their specific objectives, their activities, or indeed the sectors that they will support.

It was concluded that whilst there was no overlap between the two operations, that nevertheless, should they both be successful in reaching a positive funding decision, they would signpost work to each other when appropriate, and commit to formally engaging with each other on, say an annual basis, with a view to exchanging information and keeping current with each others activities.

I trust that you will find this to be an accurate record of our discussions, but should you wish to add or change anything, I would be pleased to receive your comments,

Best regards,

Rob

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Appendix VI - SWOT Analysis

The ASTUTE project has been running since 2010 and lessons learned from the activities over the last 5 years form a vital input to the shaping of the proposal for ASTUTE 2020. We have taken in to consideration both our own findings and those of the independent evaluations, with sources of including:

- The mid-term and the Final Evaluation carried out by Ciotek Ltd.
- Detailed discussions between the partner institutions that have taken place at the Executive Management Committee over the past two years and at special events such as the ASTUTE reviews, the most recent of which was at the Pierhead Building at Cardiff in July 2014.
- Opinions of the Stakeholders via the Stakeholder Advisory Board meetings held every six months.
- Feedback from Companies on the Collaborative Projects we have carried out with them.
- An independent study by GWOS Ltd. that involved Horizon Scanning of Megatrends in the Global Manufacturing Sector.

From the foregoing we have constructed a SWOT analysis of ASTUTE and how it could progress in the future. This is presented below.

Strengths

S1 ASTUTE is a unique partnership across Wales that comprises specialist manufacturing related expertise from eight Universities working together to help manufacturing companies in WWV.

S2 Since 2010, close to 300 Enterprises have been assisted by ASTUTE, with evidence gathered (as of 19th July[50]) for 174 jobs created, £9.7 Million of Investment Induced and 383 new or improved products processes and services launched ASTUTE has achieved nearly all the target levels of outputs and results agreed in the original business plan. In many cases these levels have been considerably exceeded.

S3 ASTUTE has received extremely positive feedback from the companies we have collaborated with. This has been documented in the project completion reports that the companies have completed and signed off.

S4 The mid-term and Final Evaluation of ASTUTE carried out by Ciotek Ltd. were extremely

[50] Subject to final verification

positive.

S5 ASTUTE was described as being "seen by many companies as being effective and the only real business support mechanism aimed at helping Welsh Manufacturing companies" in a *Manufacturing Supply Chain Development Study* written by The Centre for Supply Chain Operations and Procurement Excellence for the Welsh Government's Advanced Materials and Manufacturing team in 2014.

S6 ASTUTE has delivered real and measurable performance improvements to businesses into the Cross Cutting themes areas of Equal Opportunities and Environmental Sustainability, the delivery of which has been highlighted by the WEFO as an exemplar of best practice within the current CCTs portfolio.

S7 ASTUTE has a strong and effective governance structure. Several audits and inspections of ASTUTE have taken place, including the two EFAT audits in September 2014 and in May 2015. No significant problems were identified and ASTUTE was considered to be a well-run project.

S8 ASTUTE has facilitated high quality, industrially-relevant joint research between separate Welsh Universities and this has resulted in publication of several papers in internationally recognised journals and conferences.

S9 ASTUTE is seen in Europe as an exemplar of Industry-University collaboration and was invited to Brussels to speak at an expert workshop on "SMEs readiness factors for adopting advanced manufacturing products and modernising their business" in February 2015.

S10 ASTUTE supported the establishment of a new International Conference series on Sustainable Design and Manufacturing, with the inaugural event taking place in Cardiff with over 130 delegates from more than 20 countries. This conference series firmly establishes Wales as a leading centre for high quality RD&I in sustainable manufacturing.

Weaknesses

W1 The administrative burden is seen as very high. Companies often complain that there is too much, often repetitive paperwork, particularly with Collaborative R&D projects where there is a need to complete detailed timesheets. We are however continually reviewing our processes and will look to streamline these as far as possible in ASTUTE 2020 while ensuring they remain suitably robust and fully aligned with WEFO/ERDF requirements.

W2 Companies would like to see faster project decision times and where appropriate "decisions in principle" on a potential project at an early stage.

W3 In terms of the way we deal with Intellectual Property to ensure that State Aid is correctly addressed, issues it is clear that the approach taken by ASTUTE confuses and deters some companies. Furthermore, differing institutional approaches to IP hinder the development of

cluster activities.

W4 There is a lack of awareness of ASTUTE in some quarters.

W5 ASTUTE is sometimes perceived as a broad generic project that does not concentrate its efforts on its main specialisations.

W6 ASTUTE is limited to the West Wales and the Valleys region when many key firms lie in the region of East Wales.

W7 Some smaller companies, particularly single person inventors, can have unrealistic expectations and interaction can be very time consuming.

Opportunities

O1 The concept of Adaptive Smart Specialisation will allow ASTUTE 2020 to concentrate its resources on the areas of greatest industrially-relevant strengths across the University partnership.

O2 Many of ASTUTE's partner Universities have recently expanded their Science and Engineering capabilities and have new state-of-the-art facilities that could be exploited through ASTUTE 2020 for the benefit of Wales.

O3 Globally emerging technology sectors such as the "Internet of Things" or "Smart Manufacturing" can provide significant innovation opportunities for Welsh manufacturing companies. ASTUTE 2020 will be in a prime position to provide them with specialist expertise in this respect.

O4 There is the possibility to extend the ASTUTE operation to East Wales, in order to respond to demands from Advanced Manufacturing companies located in the region.

O5 ASTUTE 2020 could provide a legacy for the University partners.

O6 It would be beneficial to develop links with the UK's High Value Manufacturing Catapult.

O7 Transnational links could be developed with, for example, Fraunhofer Institutes.

O8 Recent developments in electronic forms and electronic signatures provide the opportunity to streamline paperwork and speed up decision times.

Threats

T1 There is a perceived overlap with some private sector design companies. This can give the impression of private sector displacement.

T2 There is a risk of delay to ASTUTE 2020 approval. If this is the case, key staff working on the

project may leave, causing a lack of continuity. There is also then the danger of the partnership of Universities breaking apart.

T3 Disruptive developments in manufacturing technologies might overtake ASTUTE if it remains static.

Appendix VII – Risk Register

Risks And Controls for ASTUTE 2020; Owner - Johann Sienz; Printed - 14 March 2016

627 : Reputation - bureaucracy

Category	Probability	Impact	Trend	Owner	Description
Green	High	Medium	No Change	Anke Heuberger	There is a risk that we alienate companies with excessive bureaucracy.

Controls

Id	Review Period	Action On	Description
1058	Ongoing	Operation Manager & Technical Manager	simplify and pre-fill paper forms wherever possible, consider carefully which form needs to be signed when and by whom to avoid unnecessary signatures. Consider carefully which forms are required as originals for audit purposes
1057	Ongoing	Operation Manager & Technical Manager	move towards electronic forms wherever possible

626 : State Aid breach

Category	Probability	Impact	Trend	Owner	Description
Green	Medium	High	No Change	Johann Sienz	There is a risk that we inadvertently break State Aid rules.

Controls

Id	Review Period	Action On	Description
1185	Monthly	Operation Manager	budget for external legal advice on call-off basis

625 : Risk of injury/liability to staff

Category	Probability	Impact	Trend	Owner	Description
Green	Medium	Medium	No Change	Johann Sienz	There is a risk of liability/injury to staff when using equipment/ undertaking experimentation on and off-site

Controls

Id	Review Period	Action On	Description
1054	Bi-annual	Health and Safety Officer	Accident book held to continually monitor safety in the workplace
1053	Bi-annual	Health and Safety Officer	University insurance in place to cover all necessary legal liabilities of staff. Off site risk assessment must determine whether off site insurance held for visitors to site
1052	Quarterly	Health and Safety Officer	Risk assessment proforma and training records devised for completion and monitoring prior to work undertaken both on and off-site

624 : Funder priorities

Category	Probability	Impact	Trend	Owner	Description
Green	Medium	Medium	No Change	Anke Heuberger	There is a risk that priorities from EU/WG/WEFO will change during the operation, which will impact on the operation workload and achievement of outputs

Controls

Id	Review Period	Action On	Description
1050	Ongoing	Operation Manager	The Operation Manager in dialogue with REIS will continually monitor for any changes and should any change arise, this will be brought to the attention of the OMG and if necessary the EMC

623 : Match funding target

Category	Probability	Impact	Trend	Owner	Description
Green	Low	Medium	Increasing	Anke Heuberger	There is a risk that the match funding target is not met

Controls

Id	Review Period	Action On	Description
1049	Ongoing	Operation Manager	The Operation Manager will continually monitor the match funding status and should any problem arise, this will be brought to the attention of the OMG and if necessary the EMC

622 : EU regulation compliance

Category	Probability	Impact	Trend	Owner	Description
Green	Low	High	No Change	Anke Heuberger	There is a risk of non-compliance with EU regulations

Controls

Id	Review Period	Action On	Description
1048	Ongoing	Operation Manager, Legal Coordinator	OM and Legal coordinator to monitor any changes in state aid regulations.
1047	Ongoing	Operation Manager, Legal Coordinator	Ensure all interactions are within the context of the state aid rules and/or other relevant EC legislation.

621 : Cash flow

Category	Probability	Impact	Trend	Owner	Description
Green	Medium	Low	No Change	Johann Sienz	There is a risk of cash flow problems

Controls

Id	Review Period	Action On	Description
1196	Ongoing	Operation Manager, Finance Coordinator	WEFO is looking to introduce result related payments. Whichever method they propose will have to be mirrored in payments to partners.
1045	Ongoing	Operation Manager Finance Coordinator	The University will claim on a quarterly basis, and so the maximum exposure should be no more than SU cash / 20 quarters. The Operation Manager and Finance Coordinator will monitor current and projected cash flow and bring any other problems to the attention of OMG and EMC as soon as possible.

620 : Audit readiness - correspondence

Category	Probability	Impact	Trend	Owner	Description

Green	Low	Medium	No Change	Anke Heuberger	There is a risk that correspondence is not kept in order for possible audit

Controls

Id	Review Period	Action On	Description
1044	Ongoing	Operation Manager Finance Coordinator Legal Coordinator	Develop procedures for documentation requirements and carry out spot checks to ensure compliance
1043	Ongoing	Operation Manager Finance Coordinator Legal Coordinator	Develop plan for secure storage of original documents and on-line document management.

619 : Operation timescale delays

Category	Probability	Impact	Trend	Owner	Description
Green	Low	Low	Increasing	Anke Heuberger	There is a risk that timescales are not achievable due to delays with pre-requisite activities which will impact the timely delivery of plans and other outputs

Controls

Id	Review Period	Action On	Description
1042	Ongoing	SPO, PC	For individual collaborative R&D projects the Project Leader will draw up a full Gantt chart in conjunction with the lead academic assigned to that project and monitor the milestones.
1040	Quarterly	Operation Manager	The majority of the different activities take place in parallel and are not interdependent. Furthermore there is no major estates work required and minimal capital equipment has been or is to be installed. There is thus minimal risk of "critical path" activities that can cause delay to the overall project. The only milestone that has caused slippage is the appointment of new staff.

618 : HEI partner performance

Category	Probability	Impact	Trend	Owner	Description
Green	Low	Medium	No Change	Anke Heuberger	There is a risk that one or more of the HEI partners do not perform as we would like them to and do not contribute to operation results to the required level.

Controls

Id	Review Period	Action On	Description
1039	Ongoing	FC	Ultimately if partners do not deliver against targets, we re-allocate funds from them to other partners who are performing well. This has been written into the collaboration agreement.
1038	Ongoing	Operation Manager	Operation Manager to monitor performance of each partner HEI and report to Director
1037	Ongoing	Operation Manager, EMC	delivery to be incorporated in Collaboration agreement as a criterion for payment of claims
1036	Ongoing	HEI partners Operation Manager	Ensure all partners sign collaboration agreement at operation outset

617 : Target achievement & evidencing

Category	Probability	Impact	Trend	Owner	Description
Green	Medium	High	No Change	Anke Heuberger	There is a risk that the target levels for operation outputs and results are not met and/or companies we work with do not provide the evidence for operation outputs and results. WEFO have introduced result related payments so there is a risk of no payment for each claim when profiled targets are not met

Controls

Id	Review Period	Action On	Description
1035	Ongoing	Operation Manager & OMG	Develop contingency plan for any possible shortfall in target levels. -e.g highlight other positive benefits against other metrics.
1034	Ongoing	Operation Manager	Monitor achievement of targets constantly throughout operation to give early warning of under achievement.
1033	Ongoing	SPO & PC	Prioritise projects with greatest potential to deliver evidence against specified targets.
1032	Ongoing	SPO	Before commencing long term project with companies, ask them to provide (i) quantitative estimates in

			writing of likely project results, and (ii) written commitment to provide the relevant data after the work has been completed.

616 : Staff absences

Category	Probability	Impact	Trend	Owner	Description
Green	Low	High	No Change	Johann Sienz	there is a risk that insufficient resources will be available due to sickness, unplanned absences, etc. to deliver committed Project activity which will impact on the delivery of Project outputs

Controls

Id	Review Period	Action On	Description
1030	Ongoing	Operation Manager & Operation Director (PI)	conduct regular reviews of Operation commitments and secure increased funding when required
1029	Ongoing	All Team Members	create deputy cover plan and conduct training
1028	Ongoing	All Team Members	ensure working instructions documented for all regular services
1027	Bi-annual	All Team Members	maintain holiday plans

615 : WG Smart Innovation signposting

Category	Probability	Impact	Trend	Owner	Description
Green	Medium	Medium	Increasing	Johann Sienz	There is a risk that the WG Smart Innovation team does not signpost enough company projects to us

Controls

Id	Review Period	Action On	Description
1069	Ongoing	OM & OD	Liaise with WG to develop robust referral and collaboration mechanism
1026	Bi-annual	Operation Manager & Operation Director (PI)	situation will be monitored continously, if there are not enough referrals we will re-assess the situation with WEFO to see whether funds for business development might be justified

614 : Industry demand

Category	Probability	Impact	Trend	Owner	Description
Green	Low	High	Increasing	Johann Sienz	There is a risk that industry demand for the ASTUTE 2020 operation does not materialise as anticipated and/or demand is not maintained for the length of the operation as required.

Controls

Id	Review Period	Action On	Description
1024	Ongoing	Operation Director & EMC	The ASTUTE 2020 operation has been formulated so that it covers three areas of research excellence. This minimises the risk that might otherwise arise if we were associated with one particular area. We are thus in a position to adapt to changing economic drivers. Furthermore we have taken considerable steps to understand the market and are confident we can find companies that can benefit from the expertise of the pan-Wales partnership. We will carry out two horizon scanning activities and review our Adaptive Smart Specialisation areas to map them to industry demand.

613 : Core partnership

Category	Probability	Impact	Trend	Owner	Description
Green	Low	Medium	No Change	Anke Heuberger	there is a risk that Cardiff University (core partner) are not supportive of delivering the operation which will impact the ability to achieve the outputs

Controls

Id	Review Period	Action On	Description
1023	Bi-annual	Operation Manager & Operation Director (PI)	involve Cardiff in management groups throughout the operation, set meetings dates early enough to ensure CU PI representation

611 : Staff retention and recruitment

Category	Probability	Impact	Trend	Owner	Description
Red	High	High	Increasing	Johann Sienz	There is a risk that appointed staff with suitable skill sets resigns if we do not get BP sign off from WEFO soon. This will delay delivery of the operation

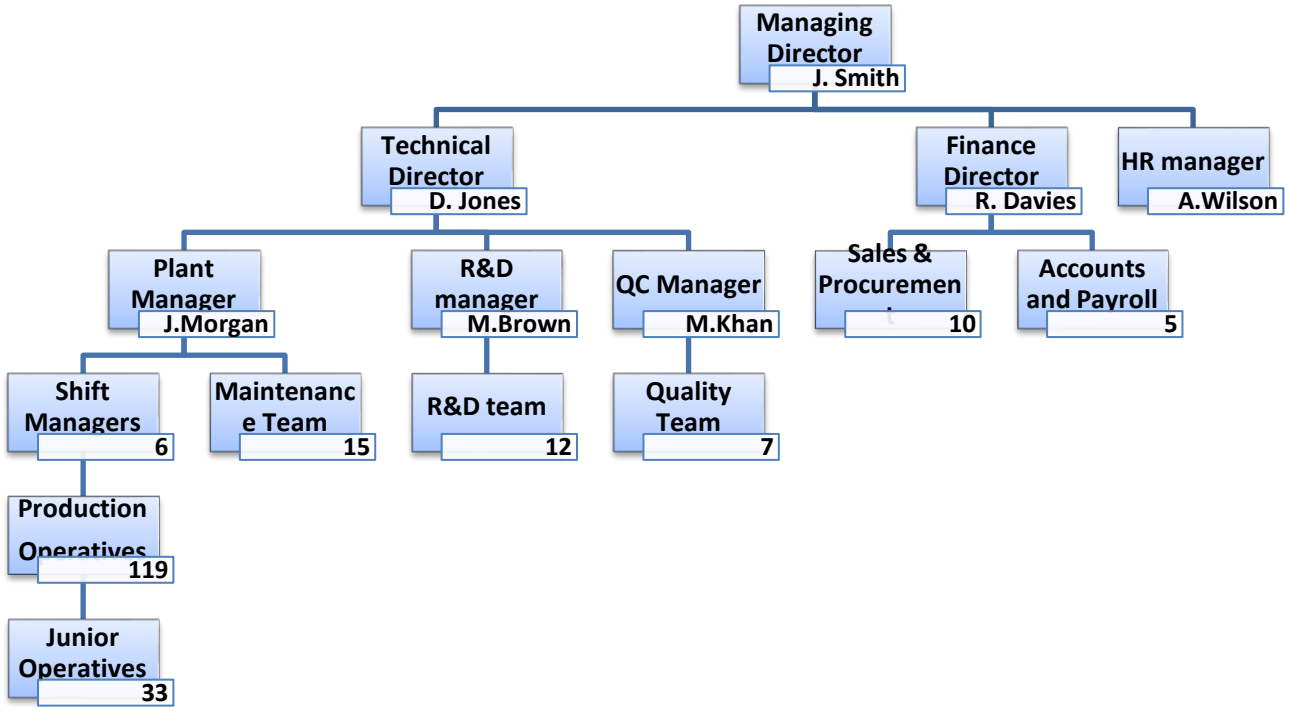
Controls

Id	Review Period	Action On	Description
1070	Ongoing	OM, PIs	delay in BP sign off wiill postpone recruitment process in Aber and UWTSD, delaying their start on the operation
1019	Ongoing	Operation Manager PIs	Most of the required staff are already in place from the last ASTUTE project but the delay in BP sign off has resulted in a number of resignations in the Cardiff and Swansea team. Cardiff and Swansea will have to recruit new team members when the BP is signed off which will delay delivery

Appendix VIII – Operation Plan

	Year 1				Year 2				Year 3				Year 4				Year 5			
	2015		2016				2017				2018				2019				2020	
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun
Continuity and Mobilisation																				
Operation staff recruitment SU and CU																				
Operation staff recruitment AU and UWTSD																				
SU and CU technical staff in place																				
Partnership Collaboration Agreement signed																				
Out of area spend notification procedure agreed																				
Monitoring and Evaluation plan draft submitted to WEFO																				
Format and date of submission for annual report agreed with WEFO																				
Procurement of Equipment and Services																				
Procurement for external evaluation																				
Information Day WG SMARTInnovation																				
Inception Evaluation																				
Finalise operational procedures																				
Operational procedures finalised																				
EMC and SAB meeting																				
Establish national and international network																				
Stakeholder engagement																				
Industrial engagement																				
Enterprises receiving non financial support	1	1	2	4																
Enterprises cooperating with supported HEIs	1	3	3	4																
Private investment matching public support in RD&I projects (£m)	0	0	0.020	0.040																
Employment increase in cooperating enterprises	0	0	0	0																
Enterprises supported to introduce new to the firm products	0	0	0	1																
Enterprises supported to introduce new to the market products	0	0	0	0																
Patents registered for products	0	0	0	0																
Development and Initial Delivery																				
Technology Awareness events																				
Launch event (format to be confirmed)																				
Inception Evaluation report finalised																				
Mid term evaluation																				
Mid term evaluation report finalised																				
Horizon scanning exercise																				
EMC meeting																				
SAB meeting																				
Establish national and international network																				
Stakeholder engagement																				
Industrial engagement																				
Gateway assessment and Re-profile sign off																				
Enterprises receiving non financial support					4	4	4	5	3	2	2	1								
Enterprises cooperating with supported HEIs					4	4	3	4	2	3	1	2								
Private investment matching public support in RD&I projects (£m)					0.065	0.120	0.150	0.195	0.130	0.280	0.220	0.300								
Employment increase in cooperating enterprises					0	2	1	3	2	7	3	5								
Enterprises supported to introduce new to the firm products					0	0	1	2	1	1	2	4								
Enterprises supported to introduce new to the market products					0	0	0	0	0	1	0	0								
Patents registered for products					0	0	0	0	0	0	0	1								
Delivery and Exit Strategy																				
Technology Awareness events																				
Final evaluation																				
Final evaluation report finalised																				
Horizon Scanning activities																				
EMC meeting																				
SAB meeting																				
Establish national and international network																				
Stakeholder engagement																				
Industrial engagement																				
Secure funding for follow-on operation																				
Project closure																				
Enterprises receiving non financial support													3	1	2	1	2	0	0	0
Enterprises cooperating with supported HEIs													1	2	1	2	0	0	0	0
Private investment matching public support in RD&I projects (£m)													0.270	0.550	0.450	0.710	0.420	0.500	0.150	0.430
Employment increase in cooperating enterprises													3	7	5	11	5	10	5	11
Enterprises supported to introduce new to the firm products													3	4	2	5	2	4	3	4
Enterprises supported to introduce new to the market products													0	1	1	0	2	1	1	1
Patents registered for products													1	0	0	0	1	1	0	1

Appendix IX –Example Company Organogram



Total Employment Level = 214 FTEs

FTEs are based on a 30 hour week, i.e. for someone employed for x hours per hours per week, they will count as:

1 FTE if x is greater than or equal to 30, or

(x/30) FTE if x is less than 30

Appendix X – Draft Partner Collaboration Agreement

DATED

_____

COLLABORATION AGREEMENT

RELATING TO THE ASTUTE 2020

Between

Swansea University

AND

[INSERT PARTY]

AND

[INSERT PARTY]

AND

[INSERT PARTY]

THIS AGREEMENT is made the [DATE]

PARTIES

SWANSEA UNIVERSITY, an educational institution with its administrative office at Singleton Park Swansea SA2 8PP, UK. ("**the Lead Beneficiary**")
[INSERT PARTY], an educational institution with an administrative officer at [ADDRESS] ("**DEFINED NAME**")

[INSERT PARTY], an educational institution with an administrative officer at [ADDRESS] ("**DEFINED NAME**")

[INSERT PARTY], an educational institution with an administrative officer at [ADDRESS] ("**DEFINED NAME**")

Parties 2 to 4 collectively Joint Beneficiaries and all collectively may be referred to as **Party** or **Parties** as appropriate

BACKGROUND

(A) The Parties have agreed arrangements to deliver the Operation ASTUTE 2020

(B) WEFO (the "**Funder**") has approved the application by way of an offer letter dated [date] which offered the Lead Beneficiary a grant entitled "*Astute 2020*"

(C) The Parties have decided to enter into this Agreement in order for the Parties to administer the grant and document and regulate their respective rights and obligations to each other in relation to:

(b) the key objectives of the Operation;

(c) the principles of collaboration;

(d) the governance structures the parties will put in place; and

(e) the respective roles and responsibilities the parties will have during the Operation.

(C) This Agreement therefore sets out the arrangements in relation to the manner in which the Parties will work together to administer the grant monies and cooperate to achieve the agreed objectives.

IT IS AGREED

1. **DEFINITIONS AND INTERPRETATION**

1.2 The following definitions and rules of interpretation apply in this agreement.

"**Agreement**" means this agreement and any schedules attached hereto;

"Background "Intellectual Property"	means any Intellectual Property controlled or owned by any of the Parties prior to the Commencement Date; or, any Intellectual Property generated by any of the Parties independently of the Operation and controlled or owned by that Party; or, any Intellectual Property to which any Party has the necessary rights for the purpose of the Operation;
"**Claim Package**"	means the various documents, including but not limited to : (i) The transaction list (ii) The progress report (iii) The claim form; (iv) The claim certification form. which the Joint Beneficiaries must complete and submit to the Lead Beneficiary for payment under the Operation. The Joint Beneficiaries acknowledge that the Claim Package may be subject to change in line with WEFO Guidelines 2014 – 2020 Claiming Arrangements
"Commencement Date"	means the [DATE];
"FOIA"	means the Freedom of Information Act 2000;
"Information Sharing Protocol"	means the protocol detailed at Schedule 2 in which the Parties shall have regard when sharing and transferring Personal Data as defined under the Data Protection Act 1998;
"Intellectual Property"	means copyright and neighbouring and related rights, trademarks and service marks, business names and domain names, rights in get-up and trade dress, goodwill and the right to sue for passing off or unfair competition, database rights, rights to use, and protect the confidentiality of, confidential information (including know-how and trade secrets), and all other intellectual property rights, in each case whether registered or unregistered.
"Key Objectives"	means the objectives for the Operation as detailed in Schedule 1;
"Operation"	means ASTUTE 2020

"Operation Intellectual Property"	any and all Intellectual Property which at any time after the Commencement Date subsists in the Operation Results (whether in their entirety or in particular features or combinations of them);
"Operation Financial Plan"	means the plan attached at Schedule 5 which sets out the Operation finances and delivery milestones expected of the Parties;
"Principal Contract"	means the agreement between the Lead Beneficiary and the Funder attached at Schedule 6;
"Term"	means for a period of [X] years from the Commencement Date;

1.3 Clause, Schedules and paragraph headings shall not affect the interpretation of this Agreement.

1.4 The Schedules form part of this Agreement and shall have effect as if set out in full in the body of this Agreement. Any reference to this Agreement includes the Schedules.

1.5 Unless the context otherwise requires, words in the singular shall include the plural and in the plural shall include the singular.

1.6 Unless the context otherwise requires, a reference to one gender shall include a reference to the other genders.

1.7 This agreement shall be binding on, and ensure to the benefit of, the parties to this agreement and their respective personal representatives, successors and permitted assigns, and references to any party shall include that party's personal representatives, successors and permitted assigns.

1.8 A reference to a statute or statutory provision is a reference to it as it is in force as at the date of this Agreement.

1.9 A reference to writing or written includes fax and e-mail.

2. SCOPE OF COLLABORATION

2.1 This Agreement sets out each Parties respective rights and obligations in delivering the Operation.

2.2 In consideration of the Lead Beneficiary having overall management and responsibility for the implementation of the Operation in accordance with the Principal Contract, the Parties hereby undertake with the Lead Beneficiary that they will:-

(i) establish and contribute to the Operation in accordance with the Delivery Profile; and,

(ii) provide the necessary facilities (and access to them) for the purposes of undertaking the Operation; and

(iii) contribute the financial, technical access and support to the success of the Operation as envisaged by the Delivery Profile; and

(iv) provide such reports and other information and attend such meetings as may be reasonably required by the Lead Beneficiary to ensure the efficient performance of the Operation; and

(v) provide any reports which may be required by the Funder and the Lead Beneficiary, including but not limited to information required for any claim, project related work, progress reports, interim reports and/or final report; and

(vi) for a period of 10 years keep all appropriate supporting documentation for all expenditure including but not limited to staff employment contracts, letter of secondment, equipment costs, invoices and timesheets; and

(vii) comply with European Union State Aid requirements and adhere to the Public Contract Regulations 2006; and,

(viii) work to the strategic targets and deliverables as set out in the Principal Contract and the Delivery Profile, unless otherwise agreed in writing by the Lead Beneficiary; and

(ix) comply with any reasonable requests or instructions from the Lead Beneficiary; and

(x) complete, sign and submit the Claim Package in accordance with clause 5; and

(xi) comply with the terms of the strategic and managerial targets as identified in the Principal Contract.

2.3 The Joint Beneficiaries agree to observe and be bound by the conditions of the Principal Contract and any special conditions as imposed by the Funder from time to time, as if they were a party to the Principal Contract, and insofar as they are capable of performance by each Party and necessary for the Lead Beneficiary to fulfil its obligations under the Principal Contract.

2.4 The Joint Beneficiaries shall refrain from doing anything which may have the effect of putting the Lead Beneficiary in breach of its obligations under the Principal Contract.

2.5 The Joint Beneficiaries agree to utilise any Customer Relationship Management (CRM) software selected by the Lead Beneficiary. Each Joint Beneficiary agrees to adhere to fair and reasonable terms of use including but not limited to software use and data protection.

2.6 Each party shall ensure that students, employees, officers and/or agents who have reason to come onto the premises of another Party to this Agreement, comply fully with all requests to adhere to such rules and regulations relating to Health & Safety and such other security arrangements as may be in force from time to time.

2.7 The Parties shall allow the other Parties access to use their equipment where such access is reasonably required in pursuance of the Operation and subject to the availability of resource, at the absolute discretion of Party which owns and maintains the equipment.

2.8 The Joint Beneficiaries acknowledge that the Lead Beneficiary is primarily liable to the Funder, and that consequently it is agreed that the Lead Beneficiary may veto any decision if such decision in the Lead Beneficiary's reasonable opinion is likely to be or to cause a breach of the terms on which the Funder has agreed to make funding available for the Operation, or otherwise creates a risk that the Funder may demand from the Lead Beneficiary repayment of any funding.

3. KEY OBJECTIVES FOR THE OPERATION

3.1 The Joint Beneficiaries shall undertake the Operation to achieve the key objectives set out in Schedule 1 to this Agreement (**Key Objectives**).

3.2 The Joint Beneficiaries agree to adopt the following principles when carrying out the Operation (**Principles**):

(i) collaborate and co-operate. Establish and adhere to the governance structure set out in this Agreement to ensure that activities are delivered and actions taken as required;

(ii) be accountable. Take on, manage and account to each other for performance of the respective roles and responsibilities set out in this Agreement;

(iii) be open. Communicate openly about major concerns, issues or opportunities relating to the Project;

(iv) learn, develop and seek to achieve full potential. Share information, experience, materials and skills to learn from each other and develop effective working practices, work collaboratively to identify solutions, eliminate duplication of effort, mitigate risk and reduce cost;
(v) adopt a positive outlook. Behave in a positive, proactive manner;
(vi) adhere to statutory requirements and best practice. Comply with applicable laws and standards including EU procurement rules, data protection and freedom of information legislation;
(vii) act in a timely manner. Recognise the time-critical nature of the Operation and respond accordingly to requests for support;
(viii) manage stakeholders effectively;
(ix) deploy appropriate resources. Ensure sufficient and appropriately qualified resources are available and authorised to fulfil the responsibilities set out in this Agreement; and
(x) act in good faith to support achievement of the Key Objectives and compliance with these Principles.
(xi) Adhere to performance requirements in delivering their pro-rate, pre-agreed targets and report to, as soon as reasonably practicable the Operational Management Group if their pre agreed targets will be missed.

4. OPERATION GOVERNANCE

Overview

4.1 The governance structure defined below provides a structure for the development and delivery of the Operation.

Guiding principles

4.2 The following guiding principles are agreed. The Operation's governance will:

(i) provide strategic oversight and direction;
(ii) be based on clearly defined roles and responsibilities at organisation, group and, where necessary, individual level;
(iii) align decision-making authority with the criticality of the decisions required;
(iv) be aligned with Operation scope (and may therefore require changes over time);
(v) leverage existing organisational, group and user interfaces;
(vi) provide coherent, timely and efficient decision-making; and
(vii) correspond with the key features of the Operation governance arrangements set out in this Agreement.

Executive Management Committee (EMC)

4.3 The EMC provides overall strategic oversight and direction to the Operation. It monitors performance and receives referral requests from the Operational Management Group. The functions, constitution and terms of reference of Board are set out in Schedule 3 Part I.

Stakeholder Advisory Board (SAB)

4.4 The SAB provides external advice on all significant matters relating to the oversight and strategy of the Operation to the EMC. The functions, constitution and terms of reference of Board are set out in Schedule 3 Part II.

Finance Committee (FC)

4.5 The FC meets by exception only to deal with proposals from the EMC or from the Operation Director which have an impact on the financial arrangements set out in Schedule 5. The functions, constitution and terms of reference of Board are set out in Schedule 3 Part III.

Operational Management Group (OMG)

4.6 The OMG provides direction in the day to day running of the Operation. The functions, constitution and terms of reference of Board are set out in Schedule 3 Part IV.

Project Committee (PC)

4.7 The PC evaluates and approves proposals for projects with industry and monitors their progress. The functions, constitution and terms of reference of Board are set out in Schedule 3 Part V.

5. PAYMENT AND EXPENSES

5.1 The Parties are aware that this Operation will require full co-operation between them for the Term and that funding is granted on the basis that the objectives and activities detailed in the Principal Contract and the Delivery Profile are achieved.

5.2 Each Joint Beneficiary shall, when requesting payment in accordance with the Delivery Profile, submit the complete Claim Package for payment at agreed intervals in accordance with their respective agreed deliverables.

5.3 Each Joint Beneficiary shall indemnify the Lead Beneficiary in respect of all losses which the Lead Beneficiary shall suffer as a result of or arising out of or in connection with any withdrawal from the Operation by that particular Joint Beneficiary or termination of this Agreement caused by a Joint Beneficiary.

5.4 The Indemnity detailed in clause 5.3 above shall be limited to the value of the funding received under this Agreement by the Defaulting Party. Such payment shall be made within thirty (30) days of receipt of undisputed invoice. The Lead Beneficiary reserves the right to charge interest at the rate of 2% above the base rate of Barclays Bank for any late payment of such undisputed invoice from the date from which payment was due to the date of actual payment.

5.5 In the event that WEFO or any auditors acting on its behalf demands the reimbursement of any sums paid to the Lead Beneficiary, then to the extent that such demand arises from the acts or omissions of a Joint Beneficiary to this Agreement, ("**Defaulting Party**") the Defaulting Party hereby agrees to reimburse the Lead Beneficiary together with any interest charged an amount equal to the amount to be reimbursed by the Lead Beneficiary to WEFO. In the event of termination of this Agreement, final payment shall be payment for the Operation work completed and agreed expenses incurred up to the date of such termination.

5.6 Each Party shall be responsible for monitoring and controlling expenditure against its own budget, and shall be responsible for meeting any overspend that it incurs from its own funds.

5.7 All expenditure relating to the Operation must be recorded in segregated accounts/cost centres within each Parties accounting system, and all supporting documentation for a period of 10 years keep, including but not limited to invoices, expense vouchers, expense claims, time sheets, Bank Statements and payroll records, must be retained and made available for inspection upon reasonable notice in order to meet any audit requirements that may be notified by WEFO or the Lead Beneficiary's own external or internal auditors.

5.8 Claims will be paid without undue delay provided that each Party submits the duly completed Claim Package and the Lead Beneficiary is satisfied, having been advised by the OMG and PC, that the claiming Party's progress on the Operation, as evidenced by documentation is in line with EMC requirements, and subject also to receipt of funds from WEFO under the Principal Contract.

5.9 The expected profile of expenditure for the Parties to implement the Operation is set out in the Delivery Profile and each claim must be aligned to this. In agreement with or upon request by WEFO the Joint Beneficiaries acknowledge and accept that the expected profile of expenditure might change.

5.10 Any underspend or overspend in a claim period should normally be corrected in the following claim, and if this is not possible any significant deviation from profile should be

commented on and communicated in the first instance to the Lead Beneficiary and furthermore to the OMG. Nevertheless, the Lead Beneficiary reserves the right in its absolute discretion not to pay any overspend except to the extent that it is offset by previous claims underspend

5.11 To the extent that the value of any claim, together with all previous claims for a party to this Agreement, exceeds the amount of funding agreed for that party, then the Lead Beneficiary shall not be liable to pay that excess until funds which are specifically earmarked to cover that excess are received from WEFO.

5.12 The Joint Beneficiaries acknowledge that in accordance with the Grant conditions, WEFO will retain 10% of the total funding until Operation completion. The Lead Beneficiary shall therefore be entitled to withhold a proportion of any claim submitted by the Joint Beneficiaries to account for such retention by WEFO.

6. TERM AND TERMINATION

Term

6.1 This Agreement shall take effect on the Commencement Date and shall continue for the Term unless terminated earlier in accordance with clause 6.2 or 6.3.

Termination

6.2 The Lead Beneficiary may terminate this Agreement forthwith in the event that WEFO terminates the Principal Contract.

6.3 The Lead Beneficiary may terminate this Agreement with any Party forthwith in the event that that Party:

(i) has failed within thirty (30) days to remedy a breach notified to them in writing; or

(ii) has committed a serious breach of its obligations under this Agreement that is not capable of remedy; or

(iii) has received at least three notices from the Lead Beneficiary of default in respect of separate breaches in any period of one year (whether or not the breaches which were the subject of the notices have been remedied).

6.4 A Joint Beneficiary (other than the Lead Beneficiary) may withdraw from this Agreement forthwith in the event that:-

(i) The Lead Beneficiary has failed within thirty (30) days to remedy a breach notified to them in writing; or

(ii) The Lead Beneficiary has committed a serious breach of its obligations under this Agreement that is not capable of remedy; or

6.5 Upon termination of this Agreement for whatever reason the Parties shall:-

(i) Return all property belonging to the Lead Beneficiary, to include all documentation, software materials in physical form (including but not limited to on paper or on computer storage media); and

(ii) Provide a final report on that part of the Operation completed.

6.6 Withdrawal from or termination of this Agreement for any reason shall not release a Party from any liability under this Agreement for any breach of its terms committed by them before the date of termination.

7. INTELLECTUAL PROPERTY

7.1 Nothing contained in this Agreement shall affect the ownership of any Background Intellectual Property.

7.2 Each Party shall own the Operation Intellectual Property generated by it under the Operation and shall be responsible for securing ownership of such Operation Intellectual Property from its employees, students (to the extent that it is lawful to do so) and other agents.

7.3 Unless agreed otherwise, each Party shall undertake and continue at its expense the timely prosecution and maintenance of protection for all Operation Intellectual Property which is solely owned by that Party, where that Party decides to do so. In the event that the owner of the Operation Intellectual Property is unable or unwilling to apply for protection for Operation Intellectual Property, the EMC shall consider how best to deal with such Operation Intellectual Property and shall have the option to request an assignment of such Operation Intellectual Property to another Party to enable prosecution and maintenance of such Operation Intellectual Property by that other Party at its own cost. In the event that the Party which owns the Operation Intellectual Property is in agreement and such an assignment takes place, any other Party wishing to exploit commercially any Operation Intellectual Property assigned pursuant to this clause 7 shall pay to the assigning Party a royalty and/or other appropriate form of remuneration which is fair and reasonable taking into consideration the respective financial and technical contributions of the Parties concerned to the development of the Operation Intellectual Property, the expenses incurred in securing intellectual property protection thereof and the costs of its commercial exploitation and any use of Background Intellectual Property.

7.4 In the event that any of the Parties are jointly responsible for generating Operation Intellectual Property such Operation Intellectual Property shall be jointly owned by such Parties in such proportions as shall be just and equitable, taking into account the respective contributions made by such Parties in terms of people, resources and money to generating such Operation Intellectual Property. Any dispute between the respective contributions of the Parties shall be determined by the EMC, which shall act at arm's length and in good faith.

7.5 Joint owners of Operation Intellectual Property shall agree between them on who shall be responsible for the timely prosecution and maintenance of all such Operation Intellectual Property and the Party that is nominated to be so responsible shall be entitled to charge the other joint owners with a percentage of the costs of so doing as agreed between the joint owners. In the absence of any agreement to the contrary between joint owners the costs shall be equally shared.

7.6 Each Party grants to the other Parties a non-exclusive, royalty-free licence to:

(i) use its Operation Intellectual Property for their own internal research and development purposes but not for the purposes of commercial/industrial research and/or commercial exploitation; and,

(ii) subject to any existing third party obligations, use its Background Intellectual Property for the purpose of undertaking the Operation and to enable the use of the Operation Intellectual Property pursuant to clause 7.6.(i) but not for the purposes of commercial/industrial research and/or commercial exploitation.

7.7 With regard to joint inventions, the Parties owning such inventions agree to cooperate fully in the protection of such joint inventions and each Party shall be entitled to make use of such joint inventions for research and development purposes. Use of such joint inventions for commercial exploitation shall be subject only to negotiating a licence in good faith from the other Party for its interest in such joint inventions to include an appropriate form of remuneration which is fair and reasonable. The Parties shall take into consideration the respective financial and technical contributions of the Parties concerned to the development of the Operation Intellectual Property, the expenses incurred in securing intellectual property

protection thereof and the costs of its commercial exploitation and any use of Background Intellectual Property.

8. VARIATION

8.1 This Agreement, including the Schedules, may only be varied by written agreement of all parties to this Agreement

9. LIABILITY

9.1 Each Party agrees to indemnify and keep indemnified the other Parties for any claim whatsoever made against one or more of the other Parties by [funding office] or any other Party to the extent that such claim is attributable to any negligence or default of the indemnifying Party or arises from the indemnifying Party infringing the intellectual property rights of third parties in the performance of the Operation or otherwise under this Agreement.

9.2 Except as set out in clauses 5.4 and 9.3, neither Party shall be liable to any other (whether in contract, tort (including negligence), breach of statutory duty, restitution or otherwise) for any indirect or consequential loss (all of which terms include, without limitation, pure economic loss, loss of profits, loss of business, depletion of goodwill and like loss) howsoever caused arising out of or in connection with this Agreement.

9.3 Nothing in this Agreement limits or excludes either Party's liability for:-

(i) death or personal injury; or

(ii) any fraud or for any sort of liability that, by law, cannot be limited or excluded; or

(iii) for any matter for which it would be illegal for any Party to exclude or to attempt to exclude its liability.

9.4 Except as set out in clauses 5.4 and 12.3, each Party's liability under this Agreement shall be limited to the monies due to them under the Operation.

9.5 During the period of this Agreement each Party agrees to maintain in force insurance adequate to cover its obligations under this Agreement.

10. Audit

10.1 The Joint Beneficiaries agree to:

(i) Do all that is necessary to enable the Lead Beneficiary to comply with any audits either of a technical or financial nature required by WEFO, adhering to timescales reasonably set by both the Lead Beneficiary and / or its auditors and releasing all of the required evidence to the Lead Beneficiary when requested including but not limited to invoices, expense vouchers, expense claims, time sheets, Bank Statements and payroll records

(ii) Co-operate fully in any audit carried out by the Lead Beneficiary and/or its auditors, Welsh Government, WEFO, the National Audit Office, Audit Commission, Auditor General for Wales, the European Commission or the European Court of Auditors or any of their representatives.

(iii) Present financial data in a format specified by the Lead Beneficiary to enable consistent reporting.

10.2 The right of Audit under this clause 10 shall survive termination or expiry of this agreement with such rights being exercisable by the by the Lead Beneficiary and/or its auditors, Welsh Government, WEFO, the National Audit Office, Audit Commission, Auditor General for Wales, the European Commission or the European Court of Auditors or any of their representatives for a period of 10 years after Operation expiry or termination.

11. SPOT-CHECKS

11.1 The Joint Beneficiaries acknowledge that the Lead Beneficiary has certain duties and responsibilities to WEFO. The Joint Beneficiaries therefore agree to do all that is necessary to facilitate spot-checks by the Lead Beneficiary to ensure accounting records and supporting documents are being kept in the correct form and for the correct document retention period.

11.2 The Lead Beneficiary shall provide reasonable notice prior to any spot-check visit.

12. DATA PROTECTION AND FREEDOM OF INFORMATION

Data Protection

12.1 Both Parties shall comply with the notification requirements under the Data Protection Act ("**DPA**")

12.2 Both Parties agree to adhere to the Information Sharing Protocol when sharing information, including Personal Data as defined in the Data Protection Act 1998.

12.3 Both Parties shall duly observe their obligations under the DPA which arise in connection with this Agreement.

Freedom of Information

12.4 All Parties acknowledge that they are subject to requirements under the FOIA and shall assist and cooperate with the Party receiving a FOIA request ("Receiving Party") to enable them to comply with any Information disclosure requirements.

12.5 Where the Receiving Party receives a request to disclose any Information that, under this Agreement, is a Party's Confidential Information, it will notify such Party and will consult with them. The Party shall respond to the Receiving Party within five (5) working days after receiving the Receiving Party's notice of the request. In the event that the Party fails to respond within the requisite period, the Receiving Party reserves the right to disclose any such Information it deems appropriate as a result of its obligations under FOIA.

12.6 The Receiving Party shall be responsible for determining at its absolute discretion whether the Information is:-

(i) exempt from disclosure in accordance with the FOIA;
(ii) to be disclosed in response to a request for information under the FOIA
(iii) and in no event shall the Party respond directly to a request for information unless expressly authorised to do so by the Receiving Party;

13. DISPUTE RESOLUTION PROCEDURE

13.1 If a dispute arises out of or in connection with this agreement or the performance, validity or enforceability of it (Dispute) then the Parties shall follow the procedure set out in this clause:

(i) The affected Party shall give written notice of the Dispute, setting out its nature and full particulars (Dispute Notice), together with relevant supporting documents. On service of the Dispute Notice, the OPERATION DIRECTOR of The Lead Beneficiary and PRINCIPAL INVESTIGATOR of the respective Joint Beneficiary shall attempt in good faith to resolve the Dispute;
(ii) if the OPERATION DIRECTOR of the Lead Beneficiary and the PRINCIPAL INVESTIGATOR the respective Joint Beneficiary are for any reason unable to resolve the Dispute within 30 days of service of the Dispute Notice, the Dispute shall be referred to the Director of Research Engagement and Innovation Services of the Lead Beneficiary and the

equivalent of the respective Joint Beneficiary shall attempt in good faith to resolve it; and

(iii) if the Director of Research Engagement and Innovation Services of the Lead Beneficiary and the equivalent of the respective Joint Beneficiary are for any reason unable to resolve the Dispute within 30 days of it being referred to them, the parties will attempt to settle it by mediation in accordance with the CEDR Model Mediation Procedure. Unless otherwise agreed between the parties, the mediator shall be nominated by CEDR Solve. To initiate the mediation, a party must serve notice in writing (ADR notice) to the other party to the Dispute, requesting a mediation. A copy of the ADR notice should be sent to CEDR Solve. The mediation will start not later than 14 days after the date of the ADR notice.

13.2 No party may commence any court proceedings under clause 20 in relation to the whole or part of the Dispute until 30 days after service of the ADR notice, provided that the right to issue proceedings is not prejudiced by a delay.

13.3 If the Dispute is not resolved within 40 days after service of the ADR notice, or either party fails to participate or to continue to participate in the mediation before the expiration of the said period of 40 days, or the mediation terminates before the expiration of the said period of 40 days, the Dispute shall be finally resolved by the courts of England and Wales in accordance with clause 20 in this Agreement.

14. ENTIRE AGREEMENT

14.1 This Agreement constitutes the entire agreement between the parties and shall supersede and extinguish all previous agreements, promises, assurances, warranties, representations, understandings, arrangements and undertakings between the parties, whether written or oral, relating to its subject matter.

15. FORCE MAJEURE

15.1 A Party shall not be liable for failure to perform its obligations under this Agreement, nor be liable to any claim for compensation or damage, nor be deemed to be in breach of this Agreement, if such failure arises from an occurrence or circumstances beyond the reasonable control of that Party (excluding an obligation to make payment).

15.2 If a Party affected by such an occurrence causes a delay of three (3) months or more, and if such delay may reasonably be anticipated to continue, then the Parties shall, in consultation with the Funding Body, discuss whether continuation of the Project is viable, or whether the Project and this Agreement should be terminated.

16. THIRD PARTY

16.1 Except as otherwise expressly provided for herein, the Parties confirm that nothing in this Agreement shall confer or purport to confer on any third party any benefit or any right to enforce any term of this Agreement for the purposes of the Contracts (Rights of Third Parties) Act 1999.

17. PARTNERSHIP

17.1 Nothing in this Agreement shall create, imply or evidence any partnership or joint venture between the Parties or the relationship between them of principal and agent.

18. PUBLICITY

18.1 The Joint Beneficiaries agree that they:

(i) shall consult with each other before issuing any press release or otherwise making any public statements with respect to this Agreement and or Operation;

(ii) shall not issue any such press release or make any such public statement without the prior consent of the Lead Beneficiary, which consent shall not be unreasonably withheld or delayed;

(iii) may, without the prior consent of the Lead Beneficiary, issue such press release or make such public statement as may be required by law or a court order.

(iv) shall only use ASTUTE 2020 trademark whether registered or unregistered in connection with this agreement. Any external communications carrying the mark must be notified in writing to the Lead Beneficiary at a reasonable timescale prior to disclosure.

19. WELSH LANGUAGE POLICY

19.1 The Authorities shall comply with the provisions of the Welsh Language Act 1993.

20. GOVERNING LAW AND JURISDICTION

20.1 This Agreement shall be governed by and construed in accordance with English law and, without affecting the escalation procedure set out in clause 12; each Authority agrees to submit to the exclusive jurisdiction of the courts of England and Wales.

21. FAIR DEALINGS

21.1 All Parties recognise that it is impracticable to make provision for every contingency which may arise during the life of this Agreement and they declare it to be their intention that this Agreement shall operate between them with fairness and without detriment to the interests of any of them and that if in the course of the performance of this Agreement, unfairness to any of them does or may result then the others shall use their reasonable endeavours to agree upon such action as may be necessary to remove the cause or causes of such unfairness.

SCHEDULE 1 KEY OBJECTIVES

ASTUTE 2020 will build on the most successful aspects of the ASTUTE Project (2010 – 2015) but taking a more focussed and concentrated approach. The World Class Engineering and Science capabilities in Welsh Universities (evidenced by the findings of very recent Research Excellence Framework 2014) will be used to further develop and embed Advanced and Sustainable Technologies into High Value Manufacturing across West Wales and the Valleys by working collaboratively with Welsh businesses. The operation will be a major contributor for a Welsh Innovation Ecosystem in the Welsh Government Grand Challenge of Advanced Engineering and Materials utilising Adaptive Smart Specialisation.

The ASTUTE 2020 team consisting of world-class academics and highly qualified Operation officers will be located in participating Welsh HEIs and will be working with manufacturing companies and company operational bases in West Wales and the Valleys. Through the networks established in the Universities, many links exist with overseas institutions and these will be maximised to enable participation of Welsh SMEs in collaborative Operations including Horizon 2020 further enhancing economic impact in West Wales and the Valleys.

The aim for ASTUTE 2020 will be as follows:

To enable transformational and sustainable growth in the manufacturing industry of West Wales and the Valleys by facilitating the adoption of advanced technologies, increasing competitiveness and future proofing. This will be achieved via an Adaptive Smart Specialisation approach, whereby a partnership of Welsh Universities will harness the world-leading and internationally excellent manufacturing expertise within them to improve the economic prosperity of the Region by means of demand-led collaborative research, development and innovation, and knowledge exchange with industry.

SCHEDULE 2 INFORMATION SHARING PROTOCOL

In this Schedule the following definitions shall apply:

Data Controller: shall have the same meaning as set out in the Data Protection Act 1998.

Data Processor: shall have the same meaning as set out in the Data Protection Act 1998.

Data Protection Legislation: the Data Protection Act 1998, the EU Data Protection Directive 95/46/EC, the Regulation of Investigatory Powers Act 2000, the Telecommunications (Lawful Business Practice) (Interception of Communications) Regulations 2000 (SI 2000/2699), the Electronic Communications Data Protection Directive 2002/58/EC, the Privacy and Electronic Communications (EC Directive) Regulations 2003 and all applicable laws and regulations relating to processing of personal data and privacy, including where applicable the guidance and codes of practice issued by the Information Commissioner.

Data Subject: shall have the same meaning as set out in the Data Protection Act 1998.

Personal Data: shall have the same meaning as set out in the Data Protection Act 1998.

Process: has the meaning given to it under the Data Protection Legislation but, for the purposes of this agreement, it shall include both manual and automatic processing.

Operation: the ASTUTE 2020 Operation.

Staff: means all persons employed by each Party to perform its obligations under this Agreement.

2.1 PROTECTION OF DATA

a. It is understood by each Party that there will be Personal Data processed by each Party. As a result of the collaborative working it is likely that, at times, Personal Data may be transferred between Parties for the benefit of the Operation.

b. This Schedule aims to clarify each Parties duty when receiving Personal Data from another Party.

c. With respect to the Parties rights and obligations under this Agreement, the Authorities agree that each Party is the Data Controller in respect of the work undertaken in that area relating to the Operation. And that if such Data is passed to another Party that Party will be regarded as the Data Processor.

d. Each Party that acts as Processor shall:

   (a) Process the Personal Data only in accordance with instructions from the Data Controller;

   (b) Process the Personal Data only to the extent, and in such manner, as is necessary for the provision of the Operation or as is required by law or any regulatory body;

(c) implement appropriate technical and organisational measures to protect the Personal Data against unauthorised or unlawful processing and against accidental loss, destruction, damage, alteration or disclosure;

(d) obtain prior written consent from the Data Controller in order to transfer the Personal Data to any affiliates for the provision of the Operation;

(e) ensure that all Employees required to access the Personal Data are informed of the confidential nature of the Personal Data and comply with the obligations set out in this Schedule;

(f) ensure that none of the Employees publish, disclose or divulge any of the Personal Data to any third party unless directed in writing to do so by the Data Controller;

(g) notify the Data Controller (within five Working Days), if it receives:

(i) a request from a Data Subject to have access to that person's Personal Data; or
(ii) a complaint or request relating to the Party's obligations under the Data Protection Legislation;
(iii) provide the other Party with full co-operation and assistance in relation to any complaint or request made, including by:
(iv) providing the Data Controller with full details of the complaint or request;
(v) providing the Data Controller with any Personal Data it holds in relation to a Data Subject (within the timescales required by the Authority); and
(vi) providing the Data Controller with any information requested .

e. Each Party shall comply at all times with the Data Protection Legislation and shall not perform its obligations under this agreement in such a way as to cause the other Party to breach any of its applicable obligations under the Data Protection Legislation.

f. Each Party agrees that if a data subject access request is received then the Party which is deemed to be Data Controller shall be responsible for all expenses relating to such request.

SCHEDULE 3 GOVERNANCE

PART I – Executive Management Committee (EMC)

MEMBERSHIP

The EMC will comprise of:

- The Operation Director (chair),
- The Head of the College of Engineering at Swansea University in his/her capacity as Senior Responsible Officer,
- The two Deputy Directors,
- The lead PI for Cardiff University,
- The lead PI for Aberystwyth University,
- The lead PI for the University of Wales Trinity Saint David,
- The Strategic Technology Manager for Swansea University.
- The Strategic Technology Manager for Cardiff University.
- The Operation Manager,
- The three Adaptive Smart Specialisation leaders,
- a WEFO representative
- Optional members are members of the Swansea and Cardiff administrative teams as required (no voting rights)

Each EMC member shall have delegated authority to make decisions, relating only to the Terms of Reference detailed in Paragraph 3 below, on behalf of their respective party.
The Operation Manager, the WEFO representative and the two Strategic Technology Managers will be in attendance, but have no votes.
All other members will have one vote.

MEETINGS AND DECISONS

- The EMC shall meet biannually and shall be held at different partner institutions or at other locations as determined by the EMC
- To constitute a quorate meeting of the EMC 5 members must be present. Decisions shall be taken by a majority vote of a meeting of the EMC. In the event of a tied vote under this clause, the Chairperson shall have the casting vote, in addition to his/her original vote
- An EMC member may appoint an authorised deputy to attend any meeting on his or her behalf. Where practicable the EMC should be made aware of such substitution. Authorised deputies shall count for the purposes of quorate meetings.
- Any meeting of the EMC may be summoned by the Lead Beneficiary on the giving of not less than 5 working days' notice to all other parties and such meeting must be held within 3 working days following expiration of the notice.
- Each member of the EMC will use their best endeavours to reach a consensus on decisions, acting reasonably and co-operatively in order to reach agreement which contributes to the success of the Operation. The agenda for each meeting will be prepared and circulated by the Operation Manager 3 working days prior to the meeting (save for requests in accordance with 2.4 above). Any party may request an item be added to the agenda.
- The minutes of the proceedings of every meeting shall be drawn up by the Operation Manager. Copies shall be circulated to all those in attendance within 2 weeks after the date of such meeting. The minutes shall be considered as accepted by the Parties if, within fifteen (15) days from receipt, no Party has objected in writing to the Chairperson.

2. TERMS OF REFERENCE

3.1 The activities of the EMC shall include but not be limited to:

(h) Determining the strategic direction of the Operation;
(i) Setting monitoring and reviewing Operation standards;
(j) Monitoring performance to include financial performance including budget spend;
(k) Resolve any conflicts between competing interests of the parties;
(l) Review the governance arrangement set out by this Agreement;
(m) Resolve any disputes referred to it;
(n) Interaction with the SAB;
(o) Decision on the need and then initiates meeting by exception of the FC

PART II – STAKEHOLDER ADVISORY BOARD (SAB)

1. MEMBERSHIP

- The SAB will comprise of:
- The Pro Vice Chancellor (PVC) Major Projects for Swansea University (chair)
- The PVC of Research for Aberystwyth University
- The PVC (Research, Innovation & Enterprise) for Cardiff University
- The PVC (Research, Innovation, Enterprise & Commercialisation) for the University of Wales Trinity Saint David
- The Operation Director
- The Lead PI for Cardiff University
- A Representative from Industry Wales
- A Representative for the Advanced Materials and Manufacturing Sector of the Welsh Government
- The Welsh Government Innovation Director
- A Representative from EEF The Manufacturer's Organisation
- The Operation Manager (no voting right)
- Representatives for each of the regional groups: Swansea Bay City Region Board, Cardiff City Region and North Wales Ambition Board will be invited to attend but will not be official members and will not have voting rights

- Each SAB member apart from the Operation Manager shall have delegated authority to make decisions, relating only to the Terms of Reference detailed in Paragraph 3 below, on behalf of their respective party.

2. MEETINGS AND DECISONS

- The SAB shall meet annually or more frequently if required and shall be held at partner Universities or other locations as determined by the SAB.
- To constitute a quorate meeting of the SAB 2/3rds of all voting members must be present. Decisions shall be taken by a majority vote of a meeting of the SAB. In the event of a tied vote under this clause, the Chairperson shall have the casting vote, in addition to his/her original vote.
- A SAB member may appoint an authorised deputy to attend any meeting on his or her behalf. Where practicable the SAB should be made aware of such substitution. Authorised deputies shall count for the purposes of quorate meetings.

- Any meeting of the SAB may be summoned on the giving of not less than 5 working days' notice to all other parties and such meeting must be held within 3 working days following expiration of the notice.
- Each member of the SAB will use their best endeavours to reach a consensus on decisions, acting reasonably and co-operatively in order to reach agreement which contributes to the success of the Operation.
- The agenda for each meeting will be prepared and circulated by the Operation Manager 3 working days prior to the meeting (save for requests in accordance with 2.4 above). Any party may request an item be added to the agenda.
- The minutes of the proceedings of every meeting shall be drawn up by the Operation Manager. Copies shall be circulated to all those in attendance within 2 weeks after the date of such meeting. The minutes shall be considered as accepted by the Parties if, within fifteen (15) days from receipt, no Party has objected in writing to the Chairperson.

TERMS OF REFERENCE

- The activities of the SAB shall include but not be limited to:
  - Provide advice to the EMC on all significant matters relating to the oversight of the Operation as brought to the attention of the SAB by the ASTUTE 2020 Operation Director.
  - Contribute to the Horizon scanning exercises envisaged for the Operation.
- The Stakeholder Advisory Board may, at its discretion, suggest new parties in the work of ASTUTE 2020 and may invite a Representative of such new party to be a member of the SAB and / or advise the EMC and / or the OMG to invite such a Representative. In such circumstance, the new party will be expected to sign up to an agreement comprising such terms from this Agreement, excluding reference to WEFO funding and obligations under the Principal Contract, and any additional terms as are deemed appropriate by Swansea, following consultation with the Parties, to involve the new party and provide suitable protection to the existing Parties. The Parties will be expected to sign amending agreements binding them to relevant terms of this Agreement in respect of the new party.

PART III –Finance Committee (FC)

MEMBERSHIP

The FC will comprise of:

- The Head of College of Engineering at Swansea University (chair),
- The Operation Director,
- One Deputy Director,
- The Lead PI for Cardiff University,
- One Co-PI for Cardiff University,
- The Operation Manager (no voting right).
- Representation from Swansea University's Research Engagement and Innovation Services department (no voting right).
- Representation from Cardiff University's Research and Innovation Services department (no voting right).

Each FC member apart from the Operation Manager shall have delegated authority to make decisions, relating only to the Terms of Reference detailed in Paragraph 3 below, on behalf of their respective party.

MEETINGS AND DECISONS

- The FC shall meet by exception on request by the EMC and shall be held at Swansea or Cardiff University or other locations as determined by the FC Chair.
- To constitute a quorate meeting of the FC all members must be present. Decisions shall be taken by a majority vote of a meeting of the FC. In the event of a tied vote under this clause, the Chairperson shall have the casting vote, in addition to his/her original vote
- A FC member may appoint an authorised deputy to attend any meeting on his or her behalf. Where practicable the FC should be made aware of such substitution. Authorised deputies shall count for the purposes of quorate meetings.
- Any meeting of the FC may be summoned on the giving of not less than 5 working days' notice to all other parties and such meeting must be held within 3 working days following expiration of the notice.
- Each member of the FC will use their best endeavours to reach a consensus on decisions, acting reasonably and co-operatively in order to reach agreement which contributes to the success of the Operation.
- The agenda for each meeting will be prepared and circulated by the Operation Manager 3 working days prior to the meeting (save for requests in accordance with 2.4 above). Any party may request an item be added to the agenda.
- The minutes of the proceedings of every meeting shall be drawn up by Operation Manager. Copies shall be circulated to all those in attendance within 2 weeks after the date of such meeting. The minutes shall be considered as accepted by the Parties if, within fifteen (15) days from receipt, no Party has objected in writing to the Chairperson.

TERMS OF REFERENCE

- The FC will inform the EMC

- The activities of the FC shall include but not be limited to dealing with proposals from the EMC which have an impact on the financial arrangements set out in Schedule 5. It shall consider whether any proposals are in the best interests of the ASTUTE 2020 Operation and of the Lead Beneficiary. If the FC agrees that this is the case they shall (subject to Clause 2.7) present a case to WEFO to seek their approval based on the original proposal or an amendment of it as they see fit. The Parties shall comply with any terms or conditions which WEFO impose on them in giving such approval.

PART IV – Operational management Committee (OMG)

MEMBERSHIP

The OMG will comprise of:

- The Operation Manager (chair),
- The Strategic Technology Manager for Swansea University,
- The Strategic Technology Manager for Cardiff University,
- The Administrative Coordinator for Cardiff University,

- Optional members are members of the Swansea and Cardiff administrative teams as required (no voting rights).

Each OMG member apart from the Optional Members shall have delegated authority to make decisions, relating only to the Terms of Reference detailed in Paragraph 3 below, on behalf of their respective party.

MEETINGS AND DECISONS

- The OMG shall meet every four to six weeks and shall be held at Swansea or Cardiff University as determined by the OMG.
- To constitute a quorate meeting of the OMG all members must be present. Decisions shall be taken by a majority vote of a meeting of the OMG. In the event of a tied vote under this clause, the Chairperson shall have the casting vote, in addition to his/her original vote.
- An OMG member may appoint an authorised deputy to attend any meeting on his or her behalf. Where practicable the OMG should be made aware of such substitution. Authorised deputies shall count for the purposes of quorate meetings.
- Any meeting of the OMG may be summoned on the giving of not less than 5 working days' notice to all other parties and such meeting must be held within 3 working days following expiration of the notice.
- Each member of the OMG will use their best endeavours to reach a consensus on decisions, acting reasonably and co-operatively in order to reach agreement which contributes to the success of the Operation.
- The agenda for each meeting will be prepared and circulated by the Operation Manager 3 working days prior to the meeting (save for requests in accordance with clause 2.4 above). Any party may request an item be added to the agenda.
- The minutes of the proceedings of every meeting shall be drawn up by the Operation Manager. Copies shall be circulated to all those in attendance within 2 weeks after the date of such meeting.

TERMS OF REFERENCE

- The OMG will report directly to the Operation Director

- The activities of the OMG shall include but not be limited to:

- Provide day to day management for the operation;
- Determine and coordinate dissemination and marketing issues for the operation

<u>PART V – Project Committee (PC)</u>

MEMBERSHIP

The PC will comprise of:

- The Operation Director (chair),
- One Deputy Director,
- The Lead PI for Cardiff University,
- A Representative for Industry Wales,
- A Representative for EEF The Manufacturer's Organisation,

- The Operation Manager, the Strategic Technology Managers for Swansea and Cardiff University and the lead PIs for Aberystwyth University and University if Wales Trinity Saint David can be invited to attend but will not be official members and will not have voting rights.

Each PC member shall have delegated authority to make decisions, relating only to the Terms of Reference detailed in Paragraph 3 below, on behalf of their respective party.

MEETINGS AND DECISONS

- The PC shall meet annually or more frequently if required] and shall be held at Swansea or Cardiff University as determined by the PC.
- To constitute a quorate decision of the PC three of the members must come to a decision. Decisions shall be taken by a majority vote of the PC. In the event of a tied vote under this clause, the Chairperson shall have the casting vote, in addition to his/her original vote
- A PC member may appoint an authorised deputy to attend any meeting or make decisions on his or her behalf. Where practicable the PC should be made aware of such substitution. Authorised deputies shall count for the purposes of quorate decisions.
- Any meeting of the PC may be summoned on the giving of not less than 5 working days' notice to all other parties and such meeting must be held within 3 working days following expiration of the notice.
- Each member of the PC will use their best endeavours to reach a consensus on decisions, acting reasonably and co-operatively in order to reach agreement which contributes to the success of the Operation.
- The agenda for each meeting will be prepared and circulated by the Operation Manager 3 working days prior to the meeting (save for requests in accordance with clause 2.4 above). Any party may request an item be added to the agenda.
- The minutes of the proceedings of every meeting shall be drawn up by the Operation Manager. Copies shall be circulated to all those in attendance within 2 weeks after the date of such meeting.
- Offline approval of Operation proposals The PC shall be able to make decisions as set out in this document without meeting in person.

TERMS OF REFERENCE

- The PC informs EMC

- The activities of the PC shall include but not be limited to:

- Assess and approve proposals for projects with industry;
- Review all projects with regards to progress and delivery at a gateway determined by the PC;
- Provide advice to the Lead Beneficiary with regards to the Operation activity of the other Parties;
- Review project completion reports and other project documentation;
- Advise on the Project Approval Process and Criteria.

SCHEDULE 4 Delivery Profile and partner Financial and Targets breakdown

SCHEDULE 5 PRINCIPAL CONTRACT

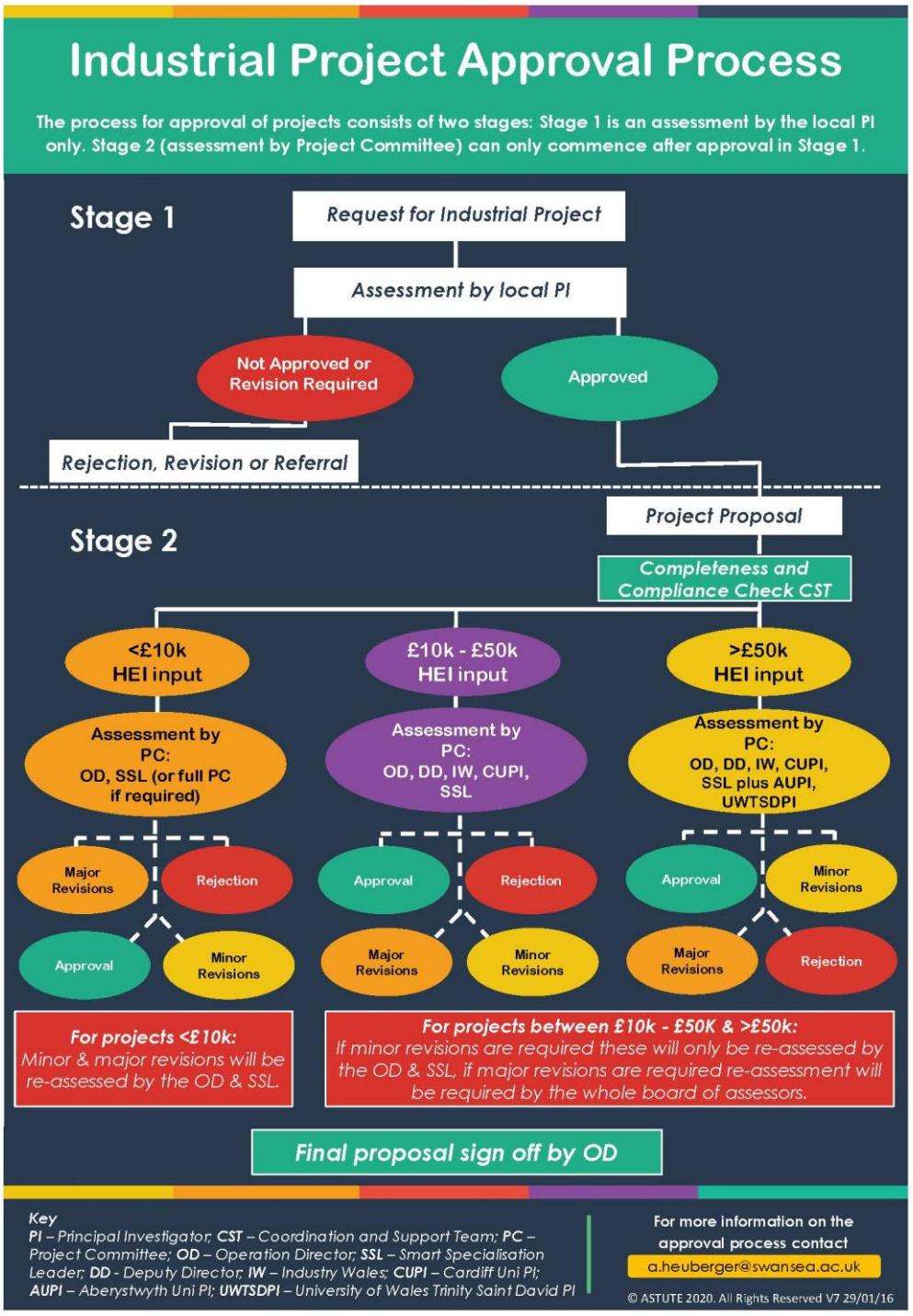
This Agreement has been entered into on the date stated at the beginning of it.

Swansea University		**[Party Name]**	
Signed		Signed	
Print		Print	
Position		Position	
Date		Date	

[Party Name]		**[Party Name]**	
Signed		Signed	
Print		Print	
Position		Position	
Date		Date	

Appendix XI – Industrial Project Selection Criteria and Approval Process

The ASTUTE 2020 Industrial Project Approval Process at a glance



Background: The Innovate UK selection process

The ASTUTE 2020 Industrial Project Selection Criteria and Approval Process have been loosely based on the Innovate UK process for selecting and approving Collaborative R&D projects that involve industrial companies working with Universities. A typical call for proposals was issued in

September 2015, and a copy of the publically available guidelines is available on the Innovate UK website.

Innovate UK use a two stage process with pre-defined criteria that are assessed independently by experts taken from both business and academia. The first step is a short "Expression of Interest" (EoI) stage, which filters out a considerable proportion of applications. Only those that are considered to be of sufficiently high standard are invited to submit a full, detailed application in the second stage. For further details of the Innovate UK process, please see below.

The ASTUTE 2020 Industrial Project approval process

The Project Approval Process involves two stages and will use criteria grouped into the following three sections:

- The Advanced Manufacturing Innovation Opportunity
- The Project/The Research Challenge
- Funding and Compliance
-

Stage 1 - Request for Industrial Project

Companies interested in working with ASTUTE 2020 will meet with one or more of the technical team members to discuss suitability, options and procedures. As an outcome of these discussions the company and the ASTUTE 2020 PO will complete a short (approx. two A4 pages) 'Request for Industrial Project' (RFIP) Form that will normally have to be signed by the MD or equivalent (most Senior Manager within the West Wales & the Valleys base). The RFIP form will include the following information:

Company Details:

- Company Name, Contact Details and Registration Number
- Trading for last 2 years Y/N?
- Number of employees currently in West Wales and the Valleys <10 Y/N

The Advanced Manufacturing Innovation Opportunity:

- What is the business opportunity that this project addresses?
- What is the size of the market opportunity that this project might open up?
- What would be the economic impact on the company?
- How will these (and any other) benefits remain long term in WWV?
- Likelihood of contribution to main ERDF outputs of ASTUTE 2020

The Project:

- What is the nature of the research the company wants from collaboration with ASTUTE 2020?
- Preferred State Aid Compliance Mechanism – to be discussed with the ASTUTE 2020 Project Officer (normally Collaborative R&D – indicate reason for choosing otherwise).
- What is the potential contribution from the company if Collaborative R&D is proposed?
- Could this work be carried out by the private sector?
- Estimated value of Enterprise and ASTUTE 2020 input
- Area(s) of Adaptive Smart Specialisation

Approval Process and Criteria for the Stage 1 Assessment

In the first stage, the lead Principal Investigator (PI) of the respective ASTUTE 2020 Partner University will assess the RFIP by the criteria outlined in Table 1. These will be Gateway (yes or no criteria) and all must be YES to allow progression to Stage 2. It is expected that the assessment process takes no longer than five working days. If the company has got less than 10 employees in

WWV or has been trading for less than two years, the company will have to complete a 'Micro-Company' Form with additional information that the PI will take into consideration for his/her assessment.

Table 1. Criteria to assess a RFIP – Stage 1

Preliminary	Is the 'Request for Industrial Project' Form complete and valid (e.g. address and registration number correct?)	**Y/N**
	Is the following condition satisfied? (Company at least 10 people employed at a base in WWV, AND has been trading for 2 years) OR Company has completed the 'Micro-Company' Form.	**Y/N**
The Advanced Manufacturing Innovation Opportunity	Does the business opportunity align with advanced, high value manufacturing?	**Y/N**
	Does the size of the market opportunity and the economic impact to the company (Transformational/Incremental/Minimal) justify an ASTUTE 2020 project?	**Y/N**
	Is there reasonable confidence that these benefits will remain long term in WWV?	**Y/N**
	Will there be a good contribution to main ERDF outputs of ASTUTE 2020?	**Y/N**
The Research Challenge/The Project	Is this project relevant to one or more of the Adaptive Smart Specialisations?	**Y/N**
	Would the research content justify a contribution to a peer reviewed paper?	**Y/N**
	To the best of your knowledge, can you exclude any (potential) duplication by the private sector?	**Y/N**
Funding and Compliance	Is the chosen State Aid mechanism compliant with the ASTUTE 2020 State Aid approach?	**Y/N**
	Has the IP share of the outcomes been discussed with the company?	**Y/N**
	Is the potential company contribution sufficient to run a project?	**Y/N**

The response back to the company from Stage 1 can include a list of questions to be addressed in the full proposal. In this way, if the assessor has reservations he/she can express these without giving a NO answer, which would prevent the project completely.

Stage 2 - Approval Process and Criteria for the Project Proposal Assessment

Based on the response to Stage 1, the company and the ASTUTE 2020 personnel will complete the 'Project Proposal' Form which will be assessed with a scoring matrix against the criteria below (Table **2**) by the Project Committee (PC). Each assessment and decision has to be fully documented. The full PC consists of: The Operation Director, one Deputy Director, the Cardiff University PI and a representative from Industry Wales. Depending on the value of the HEI project contribution, different assessors will score the proposal:

a) Assessment for projects below £10k HEI contribution:
The Operation Director will assess the proposal with advice from the relevant Adaptive Smart Specialisation leader(s) (for the Research Challenge only). It is expected that the consultation process takes no longer than five working days. There are two possible actions that the Director can take:

- If the Director believes this would be a good project, and is satisfied that there will be no private sector displacement issues, he/she can approve the project. The other members of the PC will be informed of this decision.
- Alternatively, the Director can refer the project to the full PC as in b) below. This should always be done if the Director has concerns about potential displacement. The Director can also take this action if requested to do so by the HEI that submits the proposal.
-

b) Assessment for projects above £10k below £50k HEI contribution:
All proposals will be assessed by a minimum of three PC members and the relevant Adaptive Smart Specialisation leader(s) (for the Research Challenge only). It is expected that the consultation process takes no longer than 10 working days.

c) Assessment for projects above £50k HEI contribution:
All proposals will be assessed by a minimum of three PC members plus the PIs for Aberystwyth University and University of Wales Trinity Saint David and the relevant Adaptive Smart Specialisation leader(s) (for the Research Challenge only). It is expected that the consultation process takes no longer than 15 working days.
If the members of the PC, the PIs or the Adaptive Smart Specialisation leader(s) are not available for a timely turnaround, they have to nominate a deputy with appropriate expertise.

Table 2. Criteria and guidance to assess a Project Proposal – Stage 2

<table>
<tr><td rowspan="2">Preliminary</td><td>Is the ‘Project Proposal’ Form complete and valid (Y/N)</td></tr>
<tr><td>Is the proposed project compliant with ASTUTE 2020's State Aid approach (Y/N)</td></tr>
<tr><td>Section 1: The Advanced Manufacturing Innovation Opportunity</td><td>Max 10 points per question: 70 points in total</td></tr>
<tr><td>Question:</td><td>Guidance</td></tr>
<tr><td>1.1: How well does the business opportunity align with Advanced High Value Manufacturing?</td><td>A clear majority of the project’s objectives and activities will have to be aligned with Advanced High Value Manufacturing; the assessors should not consider projects that are not aligned.
(0: no alignment to 10: excellent alignment)</td></tr>
<tr><td>1.2: To what extent is this centered on preferred Readiness levels for ASTUTE 2020*?</td><td>Discussions with the ASTUTE 2020 PO should help clarify in which Readiness level (Technology, Manufacturing, Supply Chain) this project falls under. The assessors will score as follows:
<table>
<tr><td></td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>Score</td><td>1</td><td>5</td><td>7</td><td>9</td></tr>
</table>
<table>
<tr><td>RL</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>Score</td><td>10</td><td>9</td><td>7</td><td>5</td><td>1</td></tr>
</table></td></tr>
</table>

1.3: How big is the size of the market opportunity that this project might open up? *(1.3 and 1.4 will be considered in conjunction. For instance for a project in a substantial, possibly global market, an increment might still present a high economic impact. Should the perceived total market only be very small then even a transformational impact for the company might lead to only a minor overall economic impact for Wales.)*	General description of the size of the market opportunities that this project might open up, which could include: • Size of the existing market that the company is currently operating in • Current nature and size of the specific market(s) at which the project is targeted • Potential future changes in the market. For highly innovative projects (see question 2.4) where the market may be unexplored, it should be explained: • what the route to market could or might be, • what its size might be, • how the project will seek to explore the market potential. (0: no opportunity to 10: very big opportunity)
1.4: How big would the economic Impact be to the company (e.g. Transformational/Incremental/ Minimal)?	Clear description of the size of the economic impact that this project might have on the company including details on e.g. Expected changes in business revenue, Expected changes in business profits, Expected changes in business jobs If the benefits to the company would be less than the project costs, then the economic impact would be regarded as "minimal". "Incremental" impact would be achieved where the benefits to the company will clearly exceed the project costs. "Transformational" impact would be achieved where the benefits to the company are judged to be TEN times the project costs. (0-2: Minimal, 3-6: Incremental, 7-10: Transformational)
1.5: What are the environmental and/or social sustainability benefits or risks from this project?	Benefits and risks in relation to e.g. CO2, energy, water, material reductions and/or safer, cleaner, healthier employee workplace environment or products (0: no benefits, only risks to 10: significant benefits, no risks)
1.6: How confident are you that these benefits will remain long term in WWV?	Outline of the long term strategy of the company to remain in WWV. If the company has additional operational bases outside WWV (e.g. multinational company) it should be explained how the benefits to the company are focussed on its WWV base. (0: no confidence to 10: very high level of confidence)
1.7: Contribution to main ERDF outputs for ASTUTE 2020	Information on predicted outputs will be used to score the contribution to main ERDF indicators. **Please refer to Table 3 for expected target levels**. (0: no contribution to 10: very high contribution)

Section 2: The Research Challenge	**Max 10 points per question: 90 points in total**
Question:	**Guidance**
2.1: How well is this project aligned with the leading research expertise in one or more of the Adaptive Smart Specialisations offered by the ASTUTE 2020 partnership?	A clear majority of the project's objectives and activities will have to be aligned with one or more of the Adaptive Smart Specialisations (Computational Engineering Modelling, Advanced Materials Technology and Manufacturing Systems Engineering. The assessors will also consider whether the proposal addresses the research objectives it claims to. (0: no alignment to 10: excellent alignment)
2.2: Based on the details of the technical scope, what level of confidence is there that there will be minimal risk of private sector displacement?	Yes/no answer plus details and reasons. Any evidence that the private sector cannot carry out this work should be provided. Details should be listed if parts of the project could be delivered by the private sector. Assessors will consider the evidence provided as well as their own personal knowledge of the sector. (0: no confidence to 10: very high level of confidence)
2.3: What level of confidence do you have in the adopted technical approach and in the project management?	An overview of the technical approach including the main objectives of the work should be provided together with a description of the main areas of work together with their resource and management requirements. The following should be included: • An overview of the technical approach including the main objectives/technical goals of the work, • a description of the main areas of work and their resource and management requirements, • a brief project plan including project duration and milestones, • a Gantt chart (projects above £10k HEI contribution only). If the project is related to any other project, or is likely to develop into a larger project, details should be provided. In evaluating this, the assessors will consider these questions: • Is the technical approach and methodology appropriate to the needs of the project and are the innovative steps achievable through the proposed approach? • Is the project plan sufficient in comparison to the complexity of the project? For example, is there sufficient detail to understand the tasks involved and the resources required? • Is the timing of key milestones realistic? • Is there demonstration of sufficient resource commitment and capability to undertake the project? (0: no confidence to 10: very high level of confidence)

<table>
<tr><td>2.4: What is innovative/novel about this project?</td><td>Outline of the current State of the Art including literature references should be provided. If applicable, information on previous projects between ASTUTE/ASTUTE 2020 and the company to outline previous related work that has been carried out (see also 3.1) should be included.
Description of the extent to which the project is innovative both commercially and technically. Explanation of the timeliness and novelty of the research aspects of the project in an industrial and/or academic context.
In evaluating this section assessors will consider these questions:
• Is it looking to apply and develop new technologies and/or use existing technologies in new areas?
• Has the State of the Art been assessed sufficiently to show novelty?
(0: not innovative to 10: highly innovative)</td></tr>
<tr><td>2.5: How high are the risks (technical and commercial) to project success?

(to be considered in conjunction with 2.6)</td><td>The project should have arrangements for managing the risks. Technical risks would be those where it is uncertain if the technical goals of the project can be achieved. Commercial risks are if the market for the product might disappear suddenly (e.g. if a similar/equivalent technology were developed by a competitor, or there are external economic factors such as oil price fluctuations, legislation, end users disappearing etc.).
The arrangements for managing and mitigating risks should be outlined as follows:
Identification of the key risks and uncertainties of the project and risk analysis for the project content and approach, including the technical, commercial, managerial and environmental risks as well as other uncertainties (e.g. ethical issues) associated with the project. The main risks should then be rated as High/Medium/Low
Explanation of how the project would mitigate these key risks. All significant and relevant risks and their mitigation should be addressed

Assessors will score as per table
<table>
<tr><th colspan="2" rowspan="2">Scoring for combination of risks</th><th colspan="3">Technical Risk</th></tr>
<tr><th>low</th><th>Medium</th><th>high</th></tr>
<tr><td rowspan="3">Commercial Risk</td><td>low</td><td>0-3</td><td>7-10</td><td>4-6</td></tr>
<tr><td>medium</td><td>0-3</td><td>7-10</td><td>4-6</td></tr>
<tr><td>high</td><td>0-3</td><td>4-6</td><td>0-3</td></tr>
</table>
</td></tr>
<tr><td>2.6: How are the risks</td><td>Based on the information provided for 2.5, assessors will</td></tr>
</table>

mitigated?	score: 0 (no mitigation) to 10 (excellent mitigation)
2.7: Does the project team (company and ASTUTE 2020) have the right skills and experience and access to facilities to deliver the identified benefits?	Description of the track record of the project team members in undertaking and exploiting the results of research and development projects, to show the capability to develop and exploit the technology. In evaluating this, the assessors will consider whether: • The project team has the right available mix of skills and experience to deliver the project successfully • How the organisations working together will achieve more than if they were working individually. (0: no relevant skills and experience to 10: appropriate skills and experience)
2.8: How will the results of the project be exploited by the company?	Description of the potential exploitable outputs of the project such as: products or services, processes, applications This could include, for example: the route to market; protection of intellectual property rights; reconfiguration of the value system; changes to business models and business processes and other methods of exploitation and protection. Explain whether the company has the innovation potential to absorb the innovation? (e.g. are there sufficient people with the appropriate technical qualifications in the company). In evaluating this, the assessors will consider whether the company has got a clear plan for the exploitation of the project's results and whether there is innovation potential. (0: no exploitation to 10: excellent exploitation)
2.9: How will the results be disseminated by the company and the HEI(s), what is the potential for a REF case study?	Where helpful to the exchange of best practice, and not damaging to commercial interests, the results from this work should be made public on a voluntary basis and a strategy for dissemination of generic outputs from the funded project should be included. The ASTUTE 2020 PO should include an outline plan to disseminate the project outputs in form of scientific papers etc. over a reasonable timescale. The relevance of this project to REF should be explained e.g. is there potential for a REF case study, type of scientific papers that are expected e.g. high impact journal, conference proceedings etc. (0: no dissemination to 10: excellent dissemination)
Section 3: Value for Money	**Y/N**
Question:	**Guidance**
What is the financial	If applicable, details of previous projects between the

commitment required for the project? Why is this necessary and does this add value and offer value for money?	company and ASTUTE or ASTUTE 2020 and targets that were predicted and delivered should be provided. This information will help the assessors to determine whether the proposed project will deliver. Indication of the anticipated project cost making clear the level of contribution from companies and from ASTUTE 2020 HEIs should be provided on the 'Project Proposal' Form including supporting information and explanations and task summaries for all parties. In evaluating this, the assessors will consider the following questions: • Is the budget realistic for the scale and complexity of the project? • Has a realistic budget breakdown been provided? • Have any phase breakdowns been described and justified adequately? 'YES' value for money or 'NO' no value for money

Table 3. Expected output levels for industrial projects in relation to HEI contribution.

		HEI contribution		
	total ASTUTE 2020 outputs	**£125,000**	**£100,000**	**£10,000**
Enterprises cooperating with supported HEIs	40			
Private investment matching public support in RD&I projects (£)	5,000,000	125,000	100,000	10,000
Employment increase in cooperating enterprises	80	2	1.6	0.16
Enterprises supported to introduce new to the firm products	39	0.975	0.78	0.08
Enterprises supported to introduce new to the market products	8	0.2	0.16	0.02
Patents registered for products	5	0.125	0.10	0.01

Scoring of proposals

The Coordination and Support Team will assess the proposal for completeness and compliance with State Aid and query with the Project Officer if it is incomplete or non-compliant. Each individual assessor then marks for each criterion in the scoring matrix and arrives at a decision whether to approve or reject the proposal or ask for minor or major revisions. Comments should ONLY be included where the assessors require clarification. The Adaptive Smart Specialisation leader(s) only score(s) Section 2: 'The Research Challenge'. All assessors (or their nominated deputy) will need to respond within the required timescale.

'The Advanced Manufacturing Innovation Opportunity', maximum score: 70

Low	Medium	High
0 – 25	26 – 50	51 – 70

'The Research Challenge', maximum score: 90

Low	Medium	High
0 – 30	31 – 60	61 – 90

Decision Process (see also figures below)
All marks, comments and decision from each assessor are collected by the Coordination and Support Team. The marks from each member of the PC (plus the two additional PIs for proposals above £50k HEI contribution) will be added up and averaged for each category; the marks from the Adaptive Smart Specialisation leaders will be added up and averaged for the 'Research Challenge' section.

Projects that score an average of less than 3 in the 'risk of private sector displacement' criterion will be rejected straightaway; projects that score an average of less than 6 in this criterion will be subject to further PC discussions. Where assessors have asked for clarification, the Operation Manager will send the comments back to the respective Project Officer who will respond to the queries in a separate document. The final decision by the Project Proposal will be taken by the PC on the base of the initial proposal and the clarifications provided.
If further discussions are considered necessary for a decision on a particular project, the Operation Director will call a face to face or Skype PC meeting.
All results are circulated to the relevant assessors and a decision will be issued as follows:

A. Full approval with no amendments.

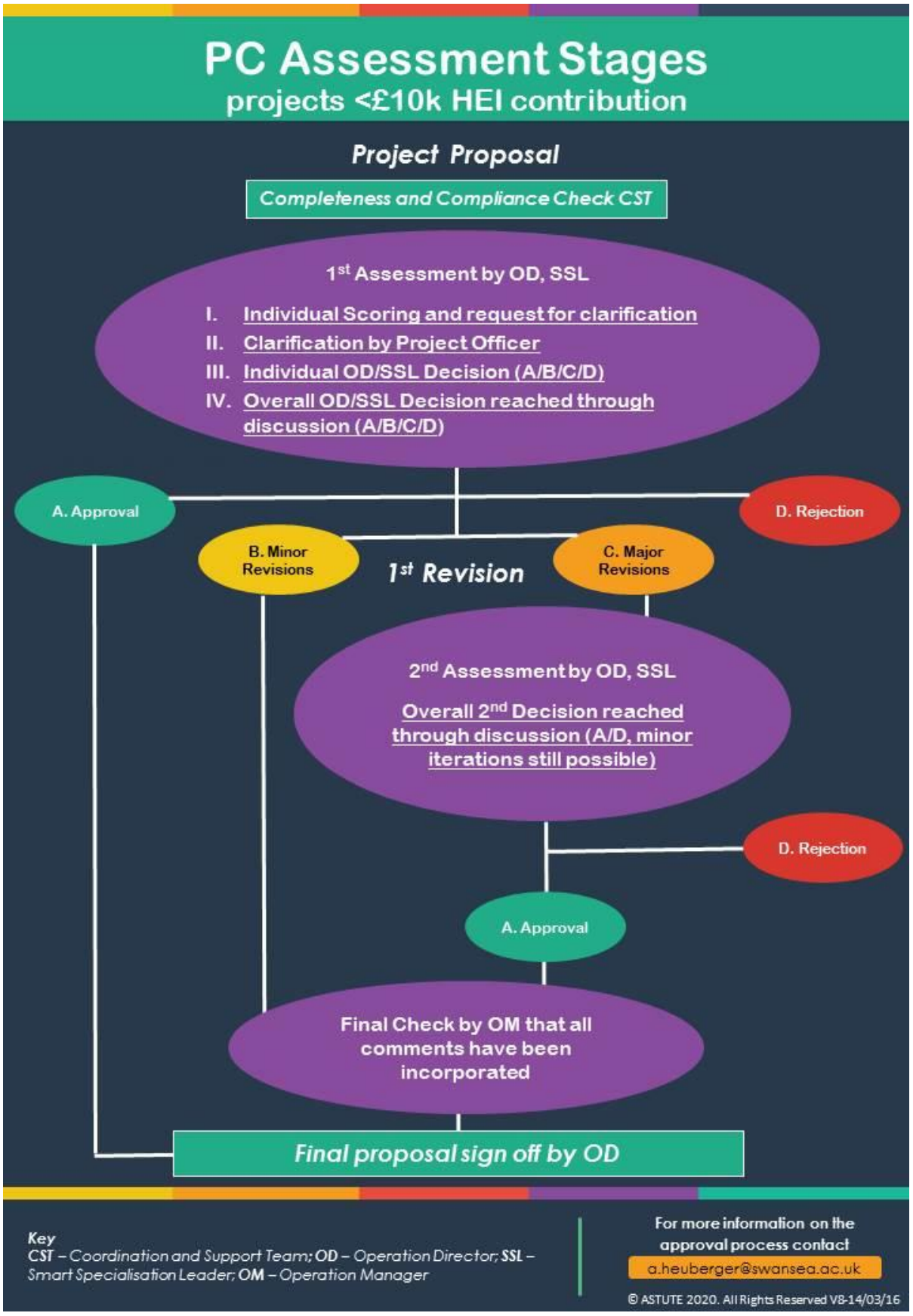
B. Approval with minor amendments: Regardless of the HEI contribution value, 1st revisions of proposals that required minor amendments will be re-assessed by the Operation Director and the relevant Adaptive Smart Specialisation leader(s) and a final decision will be taken on whether to accept or reject the proposal. All comments will be passed on to the leading PO. Further minor revisions can be requested as a condition for accepting a proposal. If further minor revisions are required, these will be outlined clearly and the PO will send the final version of the Project Proposal to the Operation Manager to confirm that the revisions have been implemented.

C. Major Amendments: 1st revisions of proposals that required major amendments will be re-assessed by the relevant assessors (as per HEI contribution value) and the Adaptive Smart Specialisation leader(s) and a final decision will be taken on whether to accept or reject the proposal. All comments will be passed on to the leading PO. Further minor revisions can be requested as a condition for accepting a proposal. If further minor revisions are required, these will be outlined clearly and the PO will send the final version of the Project Proposal to the Operation Manager to confirm that the revisions have been implemented.

D. Rejection.

The executive decision on all proposals will lie with the Operation Director as accountable person. He will have to sign off final versions of all proposals that have been accepted. The PC and EMC

will reserve the right to review the effectiveness of these procedures and implement modifications if necessary.


PC Assessment Stages
projects <£10k HEI contribution
Project Proposal
Completeness and Compliance Check CST
1st Assessment by OD, SSL
I. Individual Scoring and request for clarification
II. Clarification by Project Officer
III. Individual OD/SSL Decision (A/B/C/D)
IV. Overall OD/SSL Decision reached through discussion (A/B/C/D)
A. Approval
D. Rejection
B. Minor Revisions
1st Revision
C. Major Revisions
2nd Assessment by OD, SSL
Overall 2nd Decision reached through discussion (A/D, minor iterations still possible)
D. Rejection
A. Approval
Final Check by OM that all comments have been incorporated
Final proposal sign off by OD
Key
CST – Coordination and Support Team; OD – Operation Director; SSL – Smart Specialisation Leader; OM – Operation Manager
For more information on the approval process contact
a.heuberger@swansea.ac.uk
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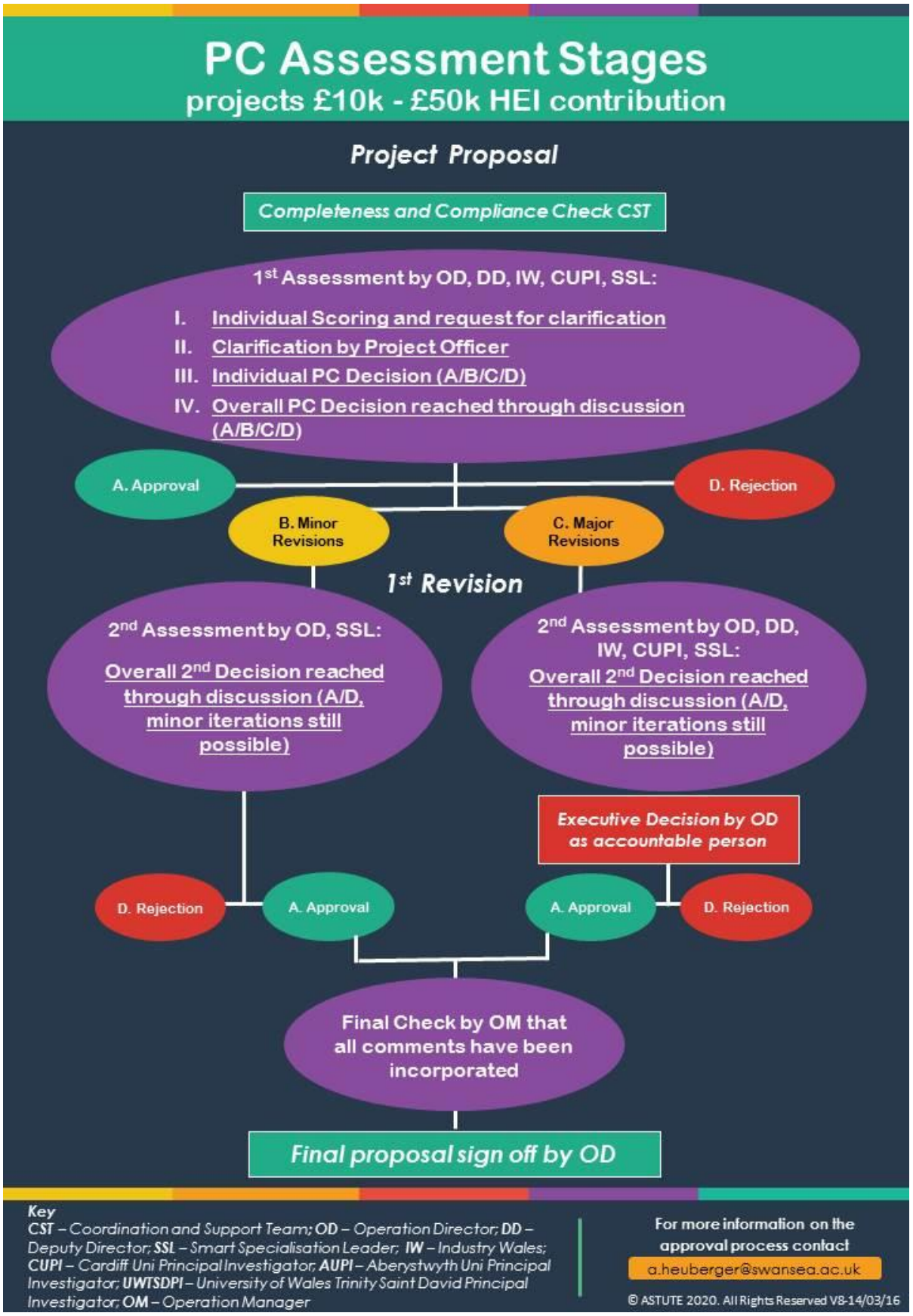
PC Assessment Stages
projects £10k - £50k HEI contribution
Project Proposal
Completeness and Compliance Check CST
1st Assessment by OD, DD, IW, CUPI, SSL:
I. Individual Scoring and request for clarification
II. Clarification by Project Officer
III. Individual PC Decision (A/B/C/D)
IV. Overall PC Decision reached through discussion (A/B/C/D)
A. Approval
D. Rejection
B. Minor Revisions
C. Major Revisions
1st Revision
2nd Assessment by OD, SSL:
Overall 2nd Decision reached through discussion (A/D, minor iterations still possible)
2nd Assessment by OD, DD, IW, CUPI, SSL:
Overall 2nd Decision reached through discussion (A/D, minor iterations still possible)
Executive Decision by OD as accountable person
D. Rejection
A. Approval
A. Approval
D. Rejection
Final Check by OM that all comments have been incorporated
Final proposal sign off by OD
Key
CST – Coordination and Support Team; OD – Operation Director; DD – Deputy Director; SSL – Smart Specialisation Leader; IW – Industry Wales; CUPI – Cardiff Uni Principal Investigator; AUPI – Aberystwyth Uni Principal Investigator; UWTSDPI – University of Wales Trinity Saint David Principal Investigator; OM – Operation Manager
For more information on the approval process contact
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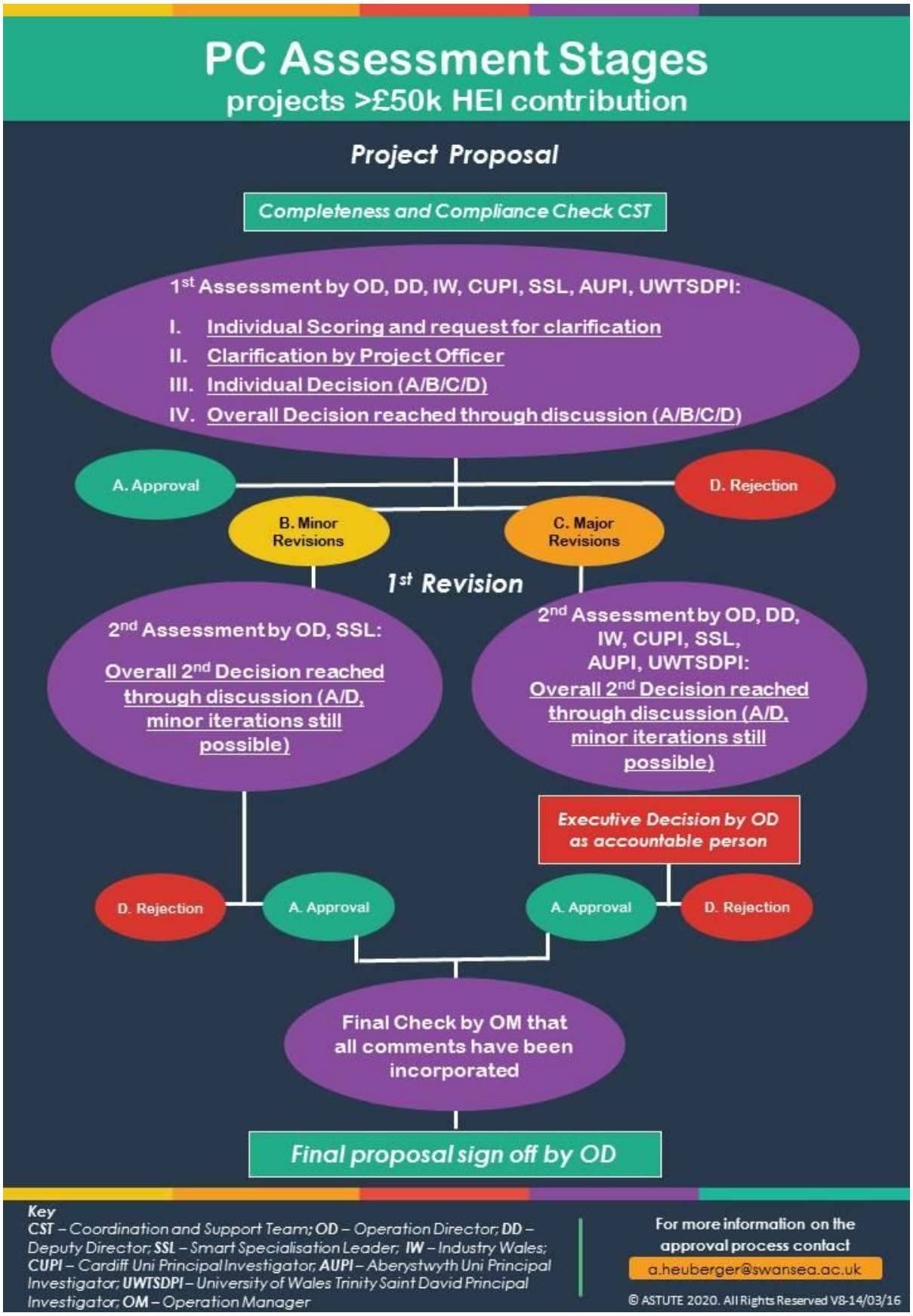
PC Assessment Stages
projects >£50k HEI contribution
Project Proposal
Completeness and Compliance Check CST
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The Innovate UK application selection process

The same assessment criteria are used for both stages, but a greater level of detail is required from the applicant in the second stage. These criteria consist firstly of a Gateway Question:

How does this application align with the specific competition scope?

This is a yes/no criterion, and if a majority of those assessing the application feel that the application does not align, then the proposal is immediately rejected.

This is then followed by a set of scored criteria, each of which is assigned a numerical value from 0 to 10, by the assessors, based on the answers provided by the applicant. These criteria are grouped as follows:

Section	Scored Criteria
The Business Proposition	1. What is the business opportunity that this project addresses?
	2. What is the size of the market opportunity that this project might open up?
	3. How will the results of the project be exploited and disseminated?
	4. What economic, social and environmental benefits is the project expected to deliver to those inside and outside of the consortium, and over what timescale?
The Project Details	5. What technical approach will be adopted and how will the project be managed?
	6. What is innovative about this project?
	7. What are the risks (technical, commercial and environmental) to project success? What is the project's risk management strategy?
	8. Does the project team have the right skills and experience and access to facilities to deliver the identified benefits?
Funding and Added Value	9. What is the financial commitment required for the project?
	10. How does financial support from Innovate UK and its funding collaborators add value?

The assessment process[51] can then be summarized as follows:

- Each application is assessed by up to five Assessors against the same set of gateway and criteria questions.
- Each Assessor is required to complete and submit a score-sheet with comments for each application.
- A report is compiled to identify ranked order of all applications.
- Following the written assessment of the full stage application, an assessment moderation panel is convened to discuss any applications that require clarification around scope, quality, feasibility or fundability. The assessment panel recommends a ranked list of applications to be funded by Innovate UK and its funding partners.
- The final recommended panel list is presented to the Funder's Panel of Innovate UK to obtain final approval for funding. Whilst Innovate UK engages assessors to act on its behalf, it retains the right of decision over scope and to whether a proposal is entitled to receive funding.
- The comments provided by the assessors noted on the score sheets form the official feedback provided to the applicant at the end of the process.

[51] https://interact.innovateuk.org/-/what-happens-when-you-have-submitted-your-application-

Appendix XII – State Aid approach and Draft State Aid Advice Letter

The purpose of this section is to give the legal background to the main activities of the ASTUTE 2020 operation from a State Aid perspective to clarify the principles described in the ASTUTE 2020 business plan. Within this document, 'RD&I framework' refers to the Framework for State aid for research and development and innovation (2014/C 198/01) of 27 June 2014, 'GBER' refers to the General Block Exemption Regulation 651/2014 (OJ L 187/1 of 26 June 2014) and 'De Minimis' refers to *De Minimis* aid as defined in COMMISSION REGULATION (EU) No 1407/2013 of 18 December 2013.

This document is to be considered in conjunction with the draft DWF LLP advice letter dated 23/06/15. It has to be noted that the terminology for the ASTUTE 2020 activities has changed slightly compared to the DWF LLP advice letter. The final version of the advice for the final Business Plan will reflect these changes.

Project approval and decision on mechanism

As described in detail in '*Delivery*' and '*Management of the Operation*', ASTUTE 2020 will have a robust project approval process including industrial participation with a set of specified criteria that determines whether an industrial project proposal will be accepted. One of the main criteria is the research challenge which is one of the key factors for the ASTUTE 2020 partners to become involved in any activity and which provides a clear distinction from private sector services.

It is essential to note here that this approval process applies to all three ASTUTE 2020 activities that are outlined below with their respective State Aid assessments.

First and foremost, ASTUTE 2020 is looking to engage with enterprises via 'RD&I collaborations' (1). A small part of the operation will be to engage and advise enterprises in innovation and R&D to promote technology transfer and to facilitate technology transfer activities in form of 'Knowledge Transfer to companies in RD&I' (2). In exceptional cases where an enterprise has signed an ASTUTE 2020 collaboration agreement but has established during the course of the collaboration that they cannot provide any of the inputs agreed, the enterprise will have to pay the HEI partner(s) to receive the results of the research project which would then fall under the activity of 'Contract RD&I' (3).

1) RD&I collaborations

The primary interaction mechanism of the ASTUTE 2020 operation will be to engage in applied, industrial research collaborations as defined in the WEFO 'Guidance on Indicator Definitions, Data and Evidence Requirements' (version 1.0, April 2015) with the manufacturing industry in WWV with the aim of knowledge exchange between the parties involved in an R&D project. ASTUTE 2020 will draw on the expertise of the academic staff at its partner institutions for scientific input. The companies will bring to bear their expertise for their specific processes, products and

applications.

The ASTUTE 2020 team will be responsible for the management of these collaborations including monitoring through a gateway system and assessing project outcomes at the completion stage. The team will also maintain project logs and spreadsheets detailing interactions and transactions associated with the collaborations.

a) 'R&D projects' under the RD&I framework

In line with section 1.3 (h) of the RD&I framework, these RD&I collaborations will be 'effective collaborations' with the aim to achieve a common objective based on the division of labour and/or other contributions whereby the parties will jointly define the scope of the collaborative project, contribute to its implementation and share its risks as well as its results. All parties will make contributions (inputs) in form of e.g. staff time, consumables, travel or machine time. All IP and know how generated will be shared in line with the inputs. Before the start of the collaboration all parties will sign a collaboration agreement that will form the basis of all activities and outlines the project plan, and the proposed share and nature of inputs and outputs, including IP.

State Aid assessment at the level of the University

The Universities are hereby regarded as research organisations that carry out non-economic activities in line with section 2.1.1. (19) of the RD&I framework, in particular independent R&D in form of effective collaboration (19a). These activities are not considered to raise a State Aid risk.

State Aid assessment at the level of the enterprise

These collaborations will be carried out in line with the RD&I framework whereby they qualify as non-economic activities which do not raise a State Aid risk in the hands of the enterprise in accordance with section 2.2.2. (28c) as all IPR resulting from the collaboration as well as its access rights will be split between the partners according to their inputs.

b) 'R&D projects' under GBER

In cases where an enterprise cannot enter into an 'effective collaboration' as defined under the RD&I framework - for example due to lack of resources or because it wants to retain all the IPR - the parties will still jointly define the scope of the collaborative project, contribute to its implementation and share its risks but the contribution ratios will be different as outlined below.

State Aid assessment at the level of the University

The Universities are hereby regarded as research organisations that carry out non-economic activities in line with section 2.1.1. (19) of the RD&I framework, in particular independent R&D in form of effective collaboration (19a). These activities are not considered to raise a State Aid risk.

State Aid assessment at the level of the enterprise

The R&D projects will be carried out under GBER Article 25 (aid for R&D) whereby the aided part of the projects will fall under one or more of the following categories: Industrial Research, Experimental Development, or Feasibility Studies whereby different aid intensities apply:

50 – 80% for Industrial Research, 25 – 80% for Experimental Development and 50 – 70% for Feasibility Studies depending on the size of the enterprise.

2) Knowledge Transfer to companies in RD&I

A small part of the operation will be to engage and advise enterprises in innovation and R&D to promote technology transfer and to facilitate technology transfer activities in form of Knowledge Transfer to companies in RD&I. Knowledge Transfer will encompass managing knowledge created by the research within the partner HEIs and will involve academics to provide input on key research and specialist areas. These activities will consist of acquiring, collecting and sharing explicit and tacit knowledge in line with the RD&I framework section 1.3(v) and will fall under the primary activities of the HEI partners in line with the RD&I framework section 2.1.1. (19b). These can involve scoping discussions and signposting or feasibility studies with the potential goal of leading to the development and facilitation of RD&I collaboration activities (as described above). In some cases it might be required that a member of the ASTUTE 2020 team works in an enterprise in a newly created role for a limited amount of time in order to properly embed the knowledge into the company. These activities will mainly be one sided with the universities providing industry with scientific or specialist know-how with no or little input from the industrial partner depending on the mechanism (please see below). The enterprises will keep all the outputs.

All parties will sign an agreement that will form the basis of the Knowledge Transfer activities. The ASTUTE 2020 team will manage these activities including monitoring assessing outcomes at the completion stage. The team will also maintain project logs and spreadsheets detailing interactions and transactions associated with the activity.

State Aid at the level of the University

The Universities are hereby regarded as research organisations that carry out non-economic activities in line with section 2.1.1. (19) of the RD&I framework in particular knowledge transfer activities (19b). These activities are not considered to raise a State Aid risk.

State Aid at the level of the enterprise

These activities will be mainly one sided with the Universities providing scientific and specialist expertise and know-how with little or no input from the enterprises depending on the aid intensity. These activities are therefore likely to classify as State Aid in the hands of the industrial partners.

The cost inputs of the University will form the basis of the valuation for this aid and will include staff costs and overheads and, as appropriate, costs for equipment and software use and materials. This aid will be provided within the framework of block exemptions, either under *De Minimis* or under GBER whereby different articles can apply (see below). Full details will be documented for each case.

GBER

For all activity undertaken under GBER, whereby Articles 28 (Innovation aid for SMEs) or 29 (aid for process and organisational innovation) could apply, the partnership will ensure that the incentive effect requirements as per Article 6.3 are met and evidenced on a case by case basis in form of a signed project proposal. In accordance with Article 11, we have notified the commission of our GBER scheme Ref: SA.42700. A description of the scheme can be downloaded from our website http://www.astutewales.com/en/astute2020.htm.

De Minimis

The value of this aid will be determined on a per user basis in order that the *De Minimis* rules are respected on a per user basis, which means the amount of benefit per user must not exceed €200,000 over any three (fiscal) year period. The use of *De Minimis* will be restricted to SMEs. To avail of *De Minimis*, enterprises will need to provide a declaration stating the *De Minimis* (if any) they have received from any source since April in the tax year of the benefit the user receives from the University, and the two immediately preceding tax years. For *De Minimis* provided after April 2015 the cumulation period would be from April 2013. *De Minimis* compliance on a per end user basis will be done by the ASTUTE 2020 partners through correspondence with each individual enterprise or a standard website postings and opt in clauses.

3) Contract RD&I

In exceptional cases where enterprises have initially signed a collaboration agreement under 'RD&I collaborations' (1) but established during the course of the collaboration that they cannot provide any in kind input as agreed, the enterprise will have to pay for the activities of the ASTUTE 2020 HEI partners, turning the collaboration into 'Contract RD&I'. The HEI activities will remain the same as assessed by the project approval process and as agreed under the initial collaboration agreement and are therefore directly linked to ASTUTE 2020 and intrinsically linked to its non-economic activities. We expect Contract RD&I to amount to considerably less than 20 % of ASTUTE 2020's activity and any income will be re-invested into the operation's primary activities.

As above, the team will manage and monitor the activity and assess outcomes at the completion stage. The team will also maintain project logs and spreadsheets detailing interactions and transactions associated with the activity.

<u>State Aid at the level of the University</u>

These activities are deemed economic in nature and the Universities can therefore not rely on the research organisation justification as for the activities above unless they do not exceed 20% of the overall annual capacity, which section 2.1.1 of the R&D framework allows for. ASTUTE 2020 will have ring-fenced accounts in all partner universities which will be monitored throughout the operation and allow for an assessment of the overall capacity and the economic and non-economic activity on the basis of forecasts and projections to ensure that the economic activity does not amount to more than 20% of the economic activity. ASTUTE 2020 projects will have gateways which will allow close monitoring on a project-by-project and subsequently a cumulative base. The agreement for collaborative RD&I contains a clause for the enterprises to provide contribution evidence at regular intervals. This clause will enable early identification of potential problems with the provision of input evidence and will therefore flag up any potential collaborations that could turn into 'Contract RD&I'. The Coordination and Support team will keep spreadsheets closely monitoring all Contract RD&I activity in order to determine whether the 20% threshold has already been reached and/or if more Contract RD&I could be carried out or if a project cannot be pursued. We will therefore be able to reject or terminate projects if the threshold has been reached.

State Aid at the level of the enterprise

The enterprises will be paying market rates for the activities of the ASTUTE 2020 partners so that there is unlikely to be an advantage and hence no risk of State Aid at their level. The University's FEC methodology will be used to determine the costs in line with section 2.2.1 (25a) of the RD&I framework. The project approval process will have established that the private sector cannot offer this type of 'service' and hence there will be no established market price. ASTUTE 2020's support to the enterprise will be unique, on a trial basis and, due to the research challenge, be carried out for the first time and for a limited period of time. If these criteria are fulfilled, the EC will normally consider the price (in this case the HEI's FEC) charged as a market price (section 2.2.1 (25a) of the RD&I framework).

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Appendix XIII Swansea University Capital Expenditure

This section presents details of the capital expenditure items proposed for the Swansea University technical delivery activities as part of ASTUTE 2020. There will be three categories where we anticipate expenditure from the ERDF grant: *Accommodation Machinery and Equipment*, *ICT Hardware* and *Estates Renovation*. In addition there will also be some expenditure that we would wish to count as Match Funding.

(i) Accommodation Machinery and Equipment (Grant)

The equipment expenditure will be made up of the following:

ALM Upgrade	£100,000
Hot Isostatic Press (HIP)	£112,000
Benchtop Metrology	£150,000
Benchtop Fatigue Machine	£80,000
Basic Cyber Physical System	£50,920
Smaller Items	£34,840
Replacements, Repairs	£20,000
Total	**£547,760**

Many of these items are related to the Additive Layer Manufacturing (ALM) machine that was purchased for the ASTUTE project 2010 to 2015. This has been used very successfully for researching novel production routes for materials synthesised by the action of lasers on metal powders. WWV has manufacturers of specialised metal powder and also potential users of components fabricated by this route, so we see this technique as being a key part of the *Advanced Materials Technology* Adaptive Smart Specialisation, with also major contributions coming from *Computational Engineering Modelling*.

To extend the capability of this technique, we will be looking to upgrade the current machine at a cost of approximately £100,000. This will enable the addition of a high powered 400 Watt laser, a more advanced control system for precise positioning of the laser with respect to the work piece, and a small build chamber facility to use less powder for smaller builds.

Our research collaborations with companies have demonstrated that while this technique produces

very high quality material, the properties can be further enhanced by a post ALM processing operation that will eliminate any residual amounts of porosity arising at junctions of powder particles. This can be achieved using a Hot Isostatic Press (HIP) which simultaneously subjects the material to high temperature and pressure. We have looked at available machines for purchase and estimate that the cost of a suitable unit would be approximately £112,000.

Further research, to be carried out downstream of the ALM/HIP operations, will involve the characterisation of the components and the material manufactured by this route to help demonstrate its capabilities for performing in the most demanding applications such as aerospace components. This will involve dimensional analysis of the test components that are produced, together with studies of the microstructure of the material when subjected to repeated cycles of mechanical stress.

For these purposes we will be looking to purchase benchtop metrology equipment, which will include a high precision, three-dimensional Coordinate Measuring Machine (CMM). The cost of this will be in the region of £150,000, and this unit will allow us to study the dimensional accuracy of ALM produced components and identify any causes of distortion as a function of process parameters such as laser power, particle size distribution of input powders etc.

The application of stress cycles can then be carried out using a benchtop fatigue machine, which we estimate will cost approximately £80,000. This will have a high frequency capability to apply an alternating stress field to the material, which in a relatively short timeframe will correspond to the expected cycles of stress that the material might encounter in during it expected service life. The resulting mechanical strain that the material encounters can then be measured by the machine's instrumentation system and samples of the material can then be sectioned and examined using our high resolution microscopy facilities, some of which, such as the Keyence optical microscope, were funded through the previous ASTUTE project. We anticipate that the fatigue machine will not be restricted to ALM materials, but will also be used for a range of other materials-related collaborative projects.

One further item of large equipment will be a basic cyber physical system, which is a robotic cell, together with a suitable guard within which it can operate. This system also helps for establish capability for Industrie 4.0 related work, which was specifically asked about by Industry Wales. The work will be supported by two newly appointed academics in Swansea with background in robotics. Investment in a robotic cell is critical to allow ASTUTE to be involved in projects with manufacturing companies to assist them in developing automated manufacturing solutions. The proposed manipulator robot and cell will give ASTUTE a suitable platform to run projects and research control sensing and work handling projects. ASTUTE will target projects to enable companies to develop automated solutions, not to replace workforce man power, but to allow them to significantly increase manufacturing output, improving their productivity. Robotics and automation has been identified as one of the UK's eight great technologies. Developing world-leading technical capabilities in this area is seen as a critical area for maintaining economic competition for the UK from other countries. We have identified a potential manipulator robot with a fully guarded cell, supplied with a handling and collision system.at £50,920. We will of course undertake a full procurement exercise to determine if there are additional options from other suppliers.

There will also be a range of smaller items of equipment that will be purchased throughout the project. We have allowed approximately £34,840 for these, and anticipate they could include a high temperature inert gas furnace for heat treatment of specimens (~£17,500), an electrochemical unit for precise current voltage measurements (~£13,000), a high precision weighing balance and a heater tank.

We have also allowed approximately £20,000 for replacement of existing equipment that may get damaged and/or be subject to wear and tear as a result of experimental work.

(ii) ICT Hardware (Grant)

The other main area at Swansea that will see significant capital expenditure from ASTUTE 2020 will be in terms of a High Performance Computer Cluster. This will be centred on the Adaptive Smart Specialisation of *Computational Engineering Modelling*, for which Swansea University has an extensive track record of research dating back to the 1960s, which has been acknowledged in UK Research Assessment Exercises (RAE) and Research Excellence Framework (REF) results.

ASTUTE has successfully harnessed this capability to enable a range of successful collaborations with companies in WWV over the period 2010 to 2015. To ensure that manufacturing in WWV has access to state of the art research in this area it is essential to invest in a new cluster which will act as a parallel computing development platform. This will enable enhanced modelling of the physical phenomena associated with manufacturing processes and manufactured products in acceptably short time frames.

This is particularly relevant at this point in time as the *HPC Wales* facility will no longer be available commercially to companies.

We have estimated that a 912 core cluster, together with associated infrastructure, will cost in the region of £300,000.

Other ITC Hardware expenditure will include replacement of stand-alone PCs and the purchase of tablet computers for project offices (which are required to comply with the "paperless office" policy at the new Bay Campus). There will also be a need to renew/enhance the server computer which is used by project officers to share project information and data files for models. We estimate that these items will cost in the region of £50,000.

(iii) Estates Renovation (Grant)

The Swansea Technical Delivery activities for ASTUTE 2020 will be based in the new Bay Campus. There will be some Estates expenditure to tailor the laboratory space to the needs of the ASTUTE 2020 equipment that will be re-located to the new buildings and the newly purchased items.

(iv) Additional Match Funding for Equipment/Hardware

In addition to the items described above we anticipate that there will be some additional capital expenditure that will be paid for by the College of Engineering at Swansea, potentially together with in-kind contributions of essential accessories that will be provided by the suppliers of the equipment. This follows the practice that was carried out under the ASTUTE project 2010 to 2015. We have therefore specified an amount of £75,000 under the category of "Accommodation: Machinery and Equipment (Match)" and a further £75,000 under the category of " ICT Hardware (Match).

Appendix XIV – Job Descriptions

This section presents job descriptions for the ASTUTE 2020 staff. Descriptions might vary slightly between similar posts in different partner institutions.

(i) ASTUTE 2020 Operation Director

Main Purpose of Job

The post will be a role for a senior academic who will contribute approximately 20% of his or her time to the ASTUTE 2020 operation. This will involve:
1. Carrying out tasks to ensure efficient and effective management of the operation;
2. Carrying out detailed strategic planning of the operation and delivering this strategy;
3. Arranging meetings of the Executive Management Group and the Stakeholder Advisory Board as required;
4. Chairing the Executive Management Group;
5. Preparing agendas and minutes and implementing actions from these meetings;
6. Monitoring, reporting and control of operation finances;
7. Monitoring, reporting and delivery of targets and outputs;
8. Preparing and implementing the sustainability plan
9. Preparing and implementing the marketing plan
10. Representing the ASTUTE 2020 operation and the University at a local, national and international level and liaising with researchers, industrialists and government agencies;
11. Supervising a small team of staff assisting with the above.

Main duties and responsibilities

The postholder will be required to:
· Provide leadership, direction and management of the ASTUTE 2020 operation including effective liaison with WEFO, stakeholders, academic and other staff at all partner institutions in order to achieve the aims of the operation;
· Prepare detailed reports showing activity, financial management, delivery of outputs and monitoring activity for the operation;
· Ensure that all HEI Partners are aware of, and comply with requirements for operation monitoring, record keeping, reporting and evidence gathering;
· Recruit staff, arrange meetings, prepare minutes and notes and implement actions with all partners to achieve the aims of the operation;
· Prepare and distribute reports on a quarterly basis showing progress of the operation against planned targets, outputs and finance;
· Prepare and implement plans for external monitoring, marketing and sustainability of the operation;
· Carry out a range of duties at a strategic and technical level involving attendance at events, presenting at conferences and meetings, hosting visits and giving advice on activities of value to the operation and / or the University;
· Manage a small team of staff assisting with the above tasks.

Term: Fixed term to 30th June 2020 subject to funding for the operation being maintained.
Hours of Work: This will be a fractional time position.

(ii) ASTUTE 2020 Operation Manager

Main Purpose of Job

The post holder will be responsible for leading the operation on all management matters including dealing with WEFO and other Universities on a routine basis. This will require the post holder to build relationships with the operation delivery teams and the management and support staff at Swansea and at all the other partners. In addition the post holder will provide support to the ASTUTE 2020 Operation Director including preparation of records and reports. In order to provide effective management, the post holder will be expected to be formally qualified to a high level in engineering and be able to interact on a professional level with senior staff at Partners, WEFO and Enterprises. The role holder will also be required to provide leadership to a small administrative coordination team in ensuring that the operation delivers its outputs and that suitable systems are in place to ensure control of expenditure, that evidence gathering is appropriate and that the operation complies with State Aid regulations. The post holder will also be responsible for marketing the project and addressing any deviation from the agreed delivery and expenditure profiles. The role holder will also be instrumental in the preparation of business plans and complex budgets for other external funding applications. Excellent communication skills both written and oral will be essential to this role.

Main Duties and Responsibilities

1. The role holder will provide leadership and management of the ASTUTE 2020 operation including effective liaison with academic and other staff at all partner institutions in order to achieve the aims of the operation.

2. S/he will be required to be familiar with the rules and regulations of the funding body, the EC and the University to ensure that all operation activity is delivered within these rules and in line with the business plan and contracts in place.

3. The role holder will be required to manage as a line manager a small team of staff responsible for collecting and recording information regarding the day to day running of the operation. S/he will be expected to set priorities and to plan workloads to deal with operation priorities as they occur, to deal with issues of pastoral care and discipline for these staff and when appropriate to involve support services and the HR department, and to develop a team spirit and to build the teams by developing individuals as required. The role holder will carry out appraisals to define goals and identify training needs and will be required to manage in the wider sense a large team of around 80 staff in the partner HEIs who are contributing to the operation.

4. The role holder will be expected to prepare detailed programmes showing activity, financial management, delivery of outputs and monitoring activity for the operation and to communicate this specialized and complex information by various means including electronic and paper based media

to other staff both within Swansea University and in the partner organizations. This will require the use of detailed spreadsheets and the ability to develop appropriate complex spreadsheets, databases and other computer based documents in order to monitor operation activity. S/he will be expected to take the initiative on identifying potential problems in any of the operation management areas and to formulate and implement solutions.

5. S/he will be required to communicate effectively with partners to ensure that all ASTUTE 2020 partners are aware of, and comply with requirements for operation monitoring, record keeping, reporting and evidence gathering. The role holder will be expected to prepare and distribute reports on a quarterly basis showing progress of the operation against planned outputs and finance and to analyse this data and to propose and implement solutions to maintain the operation delivery on track for all partners and for the operation as a whole.

6. The role holder will be expected to recruit staff, arrange meetings, prepare minutes and notes and implement actions with all partners to achieve the aims of the operation. S/he will provide suitable learning opportunities for new members of the team to be introduced to the working practices and procedures to be able to operate effectively. This activity will involve others from outside Swansea University as well as those within it and will require the post holder to be experienced and competent in giving presentations /training sessions.

7. The post holder will liaise with colleagues in the ASTUTE 2020 team to establish the needs of industry and to match partners' skills with industrial needs. S/he will be expected to contact internal and external stakeholders to ensure effective delivery of the operations and to correct any weaknesses that become apparent.

8. S/he will be expected to implement plans for external monitoring, marketing and sustainability of the operation and to explore opportunities for improvement and enhancements in a variety of areas.

9. The role holder will be required to carry out a range of duties at a strategic and technical level involving attendance at events, presenting at conferences and meetings, hosting visits and giving advice on activities of value to the operation and / or the University.

10. The post holder will need to have significant experience of working with EU funded operations in the HEI sector and have a sound understanding of WEFO/EU terminology and processes with regards to finance, outputs, State Aid compliance, and auditing.

11. The post holder will need to be highly skilled at problem solving and be able to find solutions to complex technical and organisational challenges. This may include monitoring spending on the operation and suggesting remedial actions, proposing new activity for marketing the operation or dissemination of results, responding to policy changes or amendments to guidelines from WEFO, WG or any of the Universities.

12. The post holder will need a sound understanding of and experience with University and EU regulations and procedures with regards to IP and commercialisation and their impact on the operation.

13. The role holder will be expected to contribute to strategic discussions on the development of the operation and to write business plans and draw up complex budgets for other external funding applications.

14. The post holder will normally work in a stable office environment. S/he will need to comply with legislation and guidelines for Health, Safety & Welfare of themselves and others around them.

15. The post holder should also promote equality and diversity in working practices and maintain positive working relationships and provide training and advice when necessary.

16. S/he will fully engage with the University's Performance Enabling and Welsh language policies.

17. The post holder will be required to carry out any other duties as directed by the Head of College / Department or their nominated representative expected within the grade definition.

This is a fixed term position to 30th June 2020 and the salary will be on the APM Grade 10 salary scale.

The job description sets out the duties of this post as of July 2015, it may be necessary for these duties to be varied from time to time within the grade/profile definition.

(iii) ASTUTE 2020 Finance Coordinator

Main Purpose of Job

The Finance Coordinator will be responsible for all financial aspects of the operation. S/he will deal with operation delivery staff across all partner HEIs and will also work on a daily basis with staff from different departments within Swansea University. S/he will support the Operation Manager / Director with regard to the financial delivery of the operation along with the day to day organisational and record keeping aspects. Therefore, the post holder will need significant experience of working with University financial systems and be highly skilled in the preparation of financial reconciliations and complex spreadsheets. There will also be a need to contribute to procurement and marketing activities for the operation as well as to the organization of events and other activities within the administrative coordination team.

Main Duties and Responsibilities

1. The post holder will be responsible for monitoring the financial progress of the operation and influencing budget decisions. S/he will need to take responsibility across all Partner sites and communicate effectively at a technical level with senior staff from the Partners to ensure all financial transactions are compliant with WEFO and University procedures. S/he will need to interpret WEFO guidelines and communicate these to staff at Swansea and at Partner Institutions.

2. The post holder will also be responsible for maintaining the complex financial and other records of the ASTUTE 2020 operation. S/he will be expected to financially manage the day-to-day aspects of the ERDF operation as well as to ensure that the operation is delivered in accordance

with the agreed budget and output profile. This includes managing the online financial system for ASTUTE 2020 in Swansea University and reconciling and maintaining large value accounts.

3. The post holder will need significant experience of working with EU funded operations in the HEI sector and have a sound understanding of EU financial terminology and processes. The post holder will liaise with REIS to ensure that claims are submitted to WEFO in a correct and timely manner.

4. The post holder will be in charge of regular partner spot check visits. S/he will be compiling the audit checklists according to WEFO guidelines, liaising with the partners to coordinate dates for the visits, conducting the audits and suggesting and monitoring remedial actions if necessary.

5. The post holder will be responsible for holding discussions on complex administrative issues with industrial clients, senior academic staff both within Swansea University and in the Partners, Auditors and Operation Verification Staff from WEFO and representatives of the Welsh Government. This oral communication will involve formal presentations and informal discussions and will take place on a daily basis. There will often be a requirement to present information in a written form using spreadsheets, graphs, charts and tables.

6. The post holder will be required to produce regular reports for the Operation Manager and Director to present at a range of meetings with e.g. WEFO, Partners and at the University Management Group meetings. Occasionally the post holder may be required to present reports on the progress of the operation to staff from other Institutions and to WEFO.

7. There will be a need to demonstrate empathy with needs and pressures faced by SMEs and other manufacturing companies. There will also be a need for tact and negotiating skills in order to secure appropriate evidence for the delivery of the operation outcomes from Partners, Enterprises and Individuals.

8. The post holder will be required to contribute to a small team of support staff within the University. In addition, the post holder will need to respond to changes in the operation support staff at Partner institutions and to take responsibility for integrating new members of staff at other institutions into the ASTUTE 2020 team. This will include providing training on the financial aspects of the operation and in using the required software for processing claims and progress reports.

9. The post holder will be responsible for organising their own work and coordinating the work of others who are responsible for different aspects of the operation. For example, s/he will need to motivate staff from Swansea and the Partners to work to WEFO deadlines to produce reports and claims.

10. The post holder will be required to take part in discussions with industrial contacts. This may include visiting company premises to establish their needs relevant to the financial aspects of the operation, advising them on technical aspects such as state aid, match funding and record keeping, and providing feedback to other operation staff and suggesting ways in which the interaction with companies may be improved.

11. The post holder will be required to take responsibility for planning and organising resources. S/he will need to organise the running of the office and to routinely order resources and carry out administrative tasks for ASTUTE 2020, such as booking rooms, catering for meetings, hiring cars, ordering consumables and machinery.

12. The post holder will need to be highly skilled at problem solving and be able to find solutions to complex technical and organisational challenges. This may include monitoring spending on the operation and suggesting remedial actions, proposing new activity for marketing the operation or dissemination of results, responding to policy changes or amendments to guidelines from WEFO, WG or any of the Universities.

13. The post holder will need significant experience of working with University financial systems and be highly skilled in the preparation of financial reconciliations.

14. The post holder will need to be highly skilled at designing, developing and maintaining complex spreadsheets and other databases that record resources used, company interactions and key performance indicators of the ASTUTE 2020 operation. A considerable amount of data processing will be required and there will be cases (such as the preparation of accurate quarterly claims) where this must be carried out rapidly to strict deadlines. In cases where expenditure is not as expected, there will be a need to investigate and to produce reasons why this is so. The post holder will then be expected to suggest actions to correct the situation.

15. The post holder will be responsible for coordinating and managing the WEFO verification process across all partners of the operation by ensuring verification samples are collated, prepared and submitted to WEFO and responding to queries following submission.

16. The post holder will be responsible for coordinating and managing the external grant audit process across all partners of the operation by ensuring audit samples are collated, prepared and available for review by auditors, as well as responding to any audit queries that arise during and after the audits.

17. The post holder will normally work in a stable office environment. S/he will need to comply with legislation and guidelines for Health, Safety & Welfare of themselves and others around them.

18. The post holder will be responsible for day to day liaison with Operation Partners and WEFO. There will be a need for regular information exchange using electronic and paper systems where the information is to be presented in a prescribed form. There will be a need to provide support to other staff at Swansea and other Partners to ensure that they are able to do this in order to meet strict deadlines. There will be certain amount of networking involved both with staff from other operations within Swansea University, Partner institutions and companies.

19. The post holder will also be required to make decisions according to the policies specified in the ASTUTE 2020 business plan. This may include having delegated responsibility for purchases and payments for equipment and other items that fall within the scope of the ‘coordination team’ portion of the ASTUTE 2020 budget. There will also be a requirement to interpret Procurement Regulations and other EU legislation in the context of ASTUTE 2020 operations and advise the Operation Manager accordingly. The post holder will contribute to the management meetings of the

Operation when the financial aspects of the operation are being considered.

20. There will be an occasional requirement to assist the Operation Manager in transferring knowledge about collaborative procedures and best practice to staff who are not part of the Operation team in both Swansea and in other Universities. This will include attending meetings to share ideas, discuss best practice and where possible adopt a common approach. This may include designing and presenting a training session on aspects of operation planning, delivery, record keeping or marketing.

21. This post has a critical function in monitoring and reporting on expenditure for both Swansea University and all of the other partners. The post requires leadership and motivational skills. The post holder is required to visit partner institutions and to use diplomacy, tact and persuasion to ensure compliance with European and operation imperatives. The post holder provides the first stage of internal audit and advises Partners on audit and record keeping aspects.

22. The post holder should also promote equality and diversity in working practices and maintain positive working relationships and provide training and advice when necessary.

23. S/he will fully engage with the University's Performance Enabling and Welsh language policies.

24. The post holder will be required to carry out any other duties as directed by the Head of College / Department or their nominated representative expected within the grade definition.

This is a fixed term position to 30th June 2020 and the salary will be on the APM Grade 8 salary scale. The job description sets out the duties of this post as of July 2015, it may be necessary for these duties to be varied from time to time within the grade/profile definition.

(iv) ASTUTE 2020 Targets and Procurement Coordinator

Main Purpose of Job

The ASTUTE 2020 Targets and Procurement Coordinator will be responsible for all matters relating to outputs of the operation as defined by the ERDF indicators and appropriate evidence collection. S/he will deal with partners and operation delivery staff across all partner HEIs and will also work on a daily basis with staff from different departments within Swansea University. S/he will support the Operation Manager and Director with regard to the delivery of the outputs of the operation along with the day to day organisational and record keeping aspects. There will also be a need to coordinate the procurement activity on the operation with emphasis on EU regulation compliance. Therefore, the post holder will need significant experience of working with ERDF indicators/outputs, be highly skilled in the use of spreadsheets and have experience in procurement. There will also be a need to contribute to marketing activities for the operation as well as to the

organization of events and other activities within the administrative coordination team.

Main Duties and Responsibilities

1. The post holder will be responsible for monitoring the progress of the operation outputs and influencing decisions regarding these. S/he will need to take responsibility across all Partner sites and communicate effectively at a technical level with senior staff from the Partners to ensure all outputs claimed are suitably evidenced in line with WEFO and University procedures. S/he will need to interpret WEFO guidelines and communicate these to staff at Swansea and at Partner Institutions.

2. The post holder will also be responsible for maintaining the records of the achievement of outputs of the ASTUTE 2020 operation. S/he will be expected to manage the day-to-day aspects of the ERDF operation related to outputs as well as to ensure that the operation is delivered in accordance with the agreed output profile.

3. The post holder will be responsible for holding discussions on complex administrative issues with industrial clients, senior academic staff both within Swansea University and in the Partners, Auditors and Project Verification Staff from WEFO and representatives of the Welsh Government. This oral communication will involve formal presentations and informal discussions and will take place on a daily basis. There will often be a requirement to present information in a written form using spreadsheets, graphs, charts and tables.

4. The post holder will be required to produce regular reports for the Operation Manager and Directors to present at quarterly meetings with WEFO, Partners and at the University Management Group meetings. Occasionally the post holder may be required to present reports on the progress of the operation to staff from other Institutions and to WEFO.

5. There will be a need to demonstrate empathy with needs and pressures faced by SMEs and other manufacturing companies. There will also be a need for tact and negotiating skills in order to secure appropriate evidence for the delivery of the operation outcomes from Partners, Enterprises and Individuals.

6. The post holder will be required to contribute to a small team of support staff within the University and to be responsible for introducing new members of staff to that team. In addition, the post holder will need to respond to changes in the operation support staff at Partner institutions and to take responsibility for integrating new members of staff at other institutions into the ASTUTE 2020 team. This will include providing training in evidence requirements and in using the required software for processing claims and progress reports.

7. The post holder will be required to take part in discussions with industrial contacts. This may include visiting company premises to establish their needs relevant to the outputs of the operation, advising them on technical aspects such as state aid, match funding, evidence requirements and record keeping, providing feedback to other operation staff and suggesting ways in which the interaction with companies may be improved.

8. The post holder will also be expected to assist with the organisation of promotion events

including conferences and to make updates to the ASTUTE 2020 website.

9. The post holder will be required to take responsibility for planning and organising resources. S/he will need to organise the running of the office and to routinely order resources and carry out administrative tasks, such as booking rooms and catering for meetings.

10. The post holder will need to be skilled at problem solving and be able to find solutions to complex technical and organisational challenges. This may include monitoring delivery of outputs and suggesting remedial actions, proposing new activity for marketing the operation or dissemination of results, responding to policy changes or amendments to guidelines from WEFO, WG or any of the Universities.

11. The post holder will need to be skilled at designing, developing and maintaining spreadsheets and other databases that record resources used, company interactions and key performance indicators of the ASTUTE 2020 operation. A considerable amount of data processing will be required and there will be cases (such as the preparation of accurate quarterly claims) where this must be carried out rapidly to strict deadlines. In cases where delivery of the outputs is not as expected, there will be a need to investigate and to produce reasons why this is so. The post holder will then be expected to suggest actions to correct the situation.

12. The post holder will be responsible for contributing to the enterprise database and the development of efficient systems for recording and monitoring ERDF outputs.

13. The post holder will normally work in a stable office environment. S/he will need to comply with legislation and guidelines for Health, Safety & Welfare of themselves and others around them.

14. The post holder will be responsible for day to day liaison with Operation Partners. There will be a need for regular information exchange using electronic and paper systems where the information is to be presented in a prescribed form. There will be a need to provide support to other staff at Swansea and other Partners to ensure that they are able to do this in order to meet strict deadlines. There will be certain amount of networking involved both with staff from other operations within Swansea University, Partner institutions and companies.

15. The post holder will also be required to make decisions according to the policies specified in the ASTUTE 2020 business plan. This will include advising staff and Enterprises of the best approach to provide evidence for the operation outputs. There will also be a requirement to interpret Guidelines on output definitions and other EU legislation in the context of ASTUTE 2020 operations and advise the Operation Manager accordingly. The post holder will contribute to the management meetings of the Operation when the outputs of the operation are being considered.

16. The post holder will be responsible for ensuring that all ASTUTE 2020 procurement for the administrative coordination team is carried out within WEFO, Institution and European guidelines. This will include advertising contracts and writing tender documents. There will be a requirement to manage the e-tendering of quotes and other full tender processes as required. There will also be a requirement to interpret Procurement Regulations and other EU legislation in the context of the ASTUTE 2020operation and advise the Operation Manager accordingly. The post holder will contribute to the management meetings of the Operation when the procurement aspects of the

operation are being considered. The post holder should provide advice on any procurement issues as required to all other ASTUTE 2020 partners.

17. There will be an occasional requirement to assist the Operation Manager in transferring knowledge about collaborative procedures and best practice to staff who are not part of the Operation team in both Swansea and in other Universities. This will include attending meetings to share ideas, discuss best practice and where possible adopt a common approach. This may include designing and presenting a training session on aspects of operation planning, delivery, or record keeping.

18. This post has a critical function in monitoring and reporting on delivery aspects for both Swansea University and all of the other partners. The post requires leadership and motivational skills. The post holder is required to visit partner institutions and to use diplomacy, tact and persuasion to ensure compliance with European and operation imperatives. The post holder provides the first stage of internal audit and advises Partners on audit and record keeping aspects.

19. The post holder should also promote equality and diversity in working practices and maintain positive working relationships and provide training and advice when necessary.

20. S/he will fully engage with the University's Performance Enabling and Welsh language policies.

21. The post holder will be required to carry out any other duties as directed by the Head of College / Department or their nominated representative expected within the grade definition.

This is a fixed term position to 30th June 2020 and the salary will be on the APM Grade 8 salary scale. The job description sets out the duties of this post as of July 2015, it may be necessary for these duties to be varied from time to time within the grade/profile definition.

(v) ASTUTE 2020 Legal and Contracts Coordinator

Main Purpose of Job

The ASTUTE 2020 Legal & Contracts Coordinator will be expected to provide a coordination role in respect of the complex legal aspects of the operation. S/he will support the Operation Manager and Director with regards to the delivery of all legal aspects of the operation along with the day to day organisational and record keeping aspects. An important part of the job will be monitoring and ensuring of State Aid compliance and the control of document retention for all partners. The post holder will be expected to be formally qualified to a high level in a legal discipline and be able to communicate effectively with legal specialists and draft and give advice on contracts like NDAs, Collaboration Agreements, agreements for IPR and other legal aspects. Excellent communication skills including the ability to analyse legal documentation and present clear arguments to support a course of action will be essential to this role. There will also be a need to contribute to marketing activities for the operation as well as to the organization of events and other activities within the administrative coordination team.

Main Duties and Responsibilities

1. The Legal & Contracts Coordinator will be required to produce and advise on appropriate legal documents for interaction with Enterprises and Partners working on the operation. These will include a.o. Non-Disclosure Agreements, Collaboration Agreements, Memoranda of Understanding and Contracts.

2. The Legal & Contracts Coordinator will be responsible for holding discussions on complex legal issues with enterprises, senior academic staff both within Swansea University and in the Partners and representatives of the Welsh Government. This oral communication will involve formal presentations and informal discussions and will take place on a daily basis. There will be a need to demonstrate empathy with needs and pressures faced by SMEs and other manufacturing companies. There will also be a need for tact and negotiating skills in order to secure appropriate evidence for the delivery of the operation outcomes from Partners, Enterprises and others.

3. The Legal & Contracts Coordinator will be required to understand and assess legal documentation in order to be able to advise the operation management team on the risks and concerns.

4. The post holder will be responsible for ensuring State Aid compliance of the operation and record keeping of the appropriate documentation as well as liaising with DRI, WEFO and external legal experts on matters of State Aid legislation and advice the Operation Manager and other staff accordingly.

5. The Legal & Contracts Coordinator will be responsible for facilitating all IP and IPR related activity, including ensuring that the appropriate commercial documentation is in place with all relevant partners.

6. The post holder will be responsible for maintaining legal records and other outcomes of the ASTUTE 2020 operation in the form prescribed by WEFO. S/he will be expected to manage the day-to-day aspects of the operation as well as ensuring that the operation is delivered in accordance with the agreed results and outputs profile.

7. The post holder will be required to produce regular reports for the Operation Manager and Director to present at quarterly meetings with WEFO, Partners and at other meetings. Occasionally s/he may be required to present reports on legal issues or on the progress of the operation.

8. The Legal & Contracts Coordinator will be required to make decisions according to the policies specified in the ASTUTE 2020 business plan. This will include advising staff and Enterprises of the best approach to provide evidence for State Aid compliance and other legal matters. There will also be a requirement to interpret legal frameworks and other EU legislation in the context of ASTUTE 2020 operation and advise the Operation Manager accordingly. The post holder will contribute to the management meetings of the Operation when legal aspects of the operation are being considered.

9. The Legal & Contracts Coordinator will need to be skilled at problem solving and be able to find solutions to complex technical and organisational challenges. This may include monitoring

State Aid compliance and suggesting remedial actions, proposing new activity for marketing the operation or dissemination of results, responding to policy changes or amendments to guidelines from WEFO, WG or any of the Universities.

10. The Legal & Contracts Coordinator will need to be skilled at designing, developing and maintaining spreadsheets and other databases that record resources used, company interactions and legal aspects of the ASTUTE 2020 operation. A considerable amount of data processing will be required and there will be cases (such as the preparation of accurate quarterly claims) where this must be carried out rapidly to strict deadlines.

11. The role holder will be in charge of the Risk register for the operation, keeping it up to date and discuss it with the relevant parties.

12. The post holder will be responsible for ensuring that the ASTUTE 2020 document retention policy is implemented across the whole partnership.

13. There will be an occasional requirement to assist the Operation Manager in transferring knowledge about collaborative procedures and best practice to staff who are not part of the Operation team in both Swansea and in other Universities. This will include attending meetings to share ideas, discuss best practice and where possible adopt a common approach. This may include designing and presenting a training session on legal aspects, delivery, document retention or risk management.

14. This post has a critical function in monitoring and reporting on legal aspects for both Swansea University and all of the other partners. The post requires leadership and motivational skills. The post holder is required to visit partner institutions and to use diplomacy, tact and persuasion to ensure compliance with European and operation imperatives. The post holder provides the first stage of internal audit and advises Partners on audit and record keeping aspects.

15. The post holder will normally work in a stable office environment. S/he will need to comply with legislation and guidelines for Health, Safety & Welfare of themselves and others around them.

16. The Legal & Contracts Coordinator will be required to carry out any other duties as directed by the Head of College or their nominated representative expected within the grade definition.

17. S/he will fully engage with the University's Performance Enabling and Welsh language policies.

18. The Legal & Contracts Coordinator will promote equality and diversity in working practices and maintain positive working relationships.

This is a fixed term position to 30th June 2020 and the salary will be on the APM Grade 8 salary scale. The job description sets out the duties of this post as of July 2015, it may be necessary for these duties to be varied from time to time within the grade/profile definition.

(vi) ASTUTE 2020 Communications and Admin Officer

Main Purpose of Job

The ASTUTE 2020 Communications and Admin Officer will be responsible for all communication aspects of the operation as well as for organizing all ASTUTE 2020 events and administration for the lead team. S/he will deal with all communication and marketing including design and organisation of events required by partners and will also work on a daily basis with staff from different departments within the University. S/he will support the Operation Manager / Director and other members of the admin coordination team with regard to the delivery of operation outputs along with the day to day organisational and record keeping aspects.

Main Duties and Responsibilities

1. The role holder will be expected to support the management of the day-to-day aspects of the ERDF operation as well as to ensure that the operation is delivered in accordance with the agreed profile for finance, results and outputs. S/he will need to interpret WEFO guidelines and communicate these to staff at Swansea and at Partner Institutions.

2. S/he will be required to provide full administrative support to the Operation Director/Manager and the admin coordination team.

3. The role holder will be required to produce regular reports for the Operation Manager and Operation Director.

4. The role holder will be required to collect and collate timesheet information from operation partners and companies involved with ASTUTE 2020, ensuring that this is carried out regularly by required deadlines, and maintaining a file management system of this data.

5. The role holder will be required to deal with incoming/outgoing correspondence/emails and telephone enquiries from industrial companies and log relevant details before passing potential leads on to the Operation Manager / Strategic Technology Managers. S/he will be responsible for maintaining the records for the info@astutewales.com email address, forwarding on relevant information to the technical team and following up to find out the progress of the enquiry.

6. The role holder will be required to organise the running of high level management meetings, (including recording minutes) and to liaise with visiting industrialists. Organising and being responsible for administration relating to management of meetings including the Operational, Executive and Stakeholder meetings and all preparation involved in the planning and execution of the meetings will be expected.

7. The role holder will be responsible for maintaining and monitoring all marketing decisions/budget on the operation. S/he will be managing the communication activities including print, digital and social media (website management, preparation and distribution of internal and external e-newsletters, Implementing an social media strategy covering e.g. Twitter, Facebook, LinkedIn, Flickr and YouTube channel operation publicising, monitoring and promotion).

8. The role holder will also provide an in-house design function for marketing material where

appropriate for print and digital platforms. Extensive knowledge of Adobe programmes to use during design processes of automated forms, print media and social media such as video editing will be required.

9. The role holder will also be expected to manage the organisation of attending promotion events including conferences, s/he will be responsible for overall organisation, booking and running of ASTUTE 2020 events across all partners of the operation.

10. The role holder will be responsible for organising his/her own work and coordinating the work of others who are responsible for different aspects of the operation. For example, s/he will need to motivate staff from Swansea and the Partners to work to WEFO deadlines and guidelines.

11. The role holder will need to be skilled at maintaining spread sheets and other databases that record resources used, company interactions and key performance indicators of the ASTUTE 2020 operation. A considerable amount of data processing will be required and there will be cases (such as the preparation of accurate quarterly claims) where this must be carried out rapidly to strict deadlines.

12. The role holder will be responsible for contributing to the Enterprise Database, the University's CRM system and the development of efficient systems for recording and monitoring WEFO results and Outcomes.

13. The role holder will coordinate and manage the implementation of the Universities' sustainability scheme within the ASTUTE 2020 team – preparing visual and electronic copies of evidence for audits and running the scheme throughout the year keeping up with latest activities and providing guidance on improving.

14. There will be an occasional requirement to assist the Operation Manager in transferring knowledge about collaborative procedures and best practice to other academic partners within ASTUTE 2020.

15. The role holder will be responsible for developing and updating the marketing plan of the operation, to explore opportunities for improvement and enhancements and liaise with SU's marketing department as and when required.

16. The role holder will be expected to prioritise her/his work to ensure all deadlines are met, whilst ensuring the day to day administration of the operation runs smoothly.

17. The post holder will be responsible for day to day liaison with Operation staff, Partners and WEFO. There will be a need for regular information exchange using electronic and paper systems where the information is to be presented in a prescribed form. There will be a need to provide support to other staff at Swansea and other Partners to ensure that they are able to do this in order to meet strict deadlines. There will be certain amount of networking involved both with staff from other operations within Swansea University, Partner institutions and companies.

18. The post holder will need to be skilled at problem solving and be able to find solutions to complex technical and organisational challenges. This may include discussions with internal and

external contacts suggesting remedial actions, proposing new activity for marketing the operation or dissemination of results, responding to policy changes or amendments to guidelines from WEFO, WG or any of the partner universities.

19. The post holder will also be required to make decisions according to the policies specified in the ASTUTE 2020 business plan relating to communications and marketing. The post holder will contribute to the management meetings of the Operation when the communication aspects of the operation are being considered.

20. The post holder will normally work in a stable office environment. S/he will need to comply with legislation and guidelines for Health, Safety & Welfare of themselves and others around them.

21. The post holder should also promote equality and diversity in working practices and maintain positive working relationships and provide training and advice when necessary.

22. S/he will fully engage with the University's Performance Enabling and Welsh language policies.

23. The post holder will be required to carry out any other duties as directed by the Head of College / Department or their nominated representative expected within the grade definition.

This is a fixed term position to 30th June 2020 and the salary will be on the APM Grade 7 salary scale. The job description sets out the duties of this post as of July 2015, it may be necessary for these duties to be varied from time to time within the grade/profile definition.

(vii) ASTUTE 2020 Strategic Technology Manager

Main Purpose of Job

The purpose of the role will be to develop strategy, plans and procedures, in conjunction with the Director and Operation Manager and manage the implementation of these within the Technical Delivery (TD) team for ASTUTE 2020. This will include:

1. Helping develop the Science/Technology strategy for the ASTUTE 2020 partnership:

    a. Identifying opportunities for scientific collaboration between HEI partners

    b. Participating in the process of Horizon Scanning for new technologies

    c. Identifying strategic manufacturing companies to engage with

    d. Driving the mobilisation phase

2. Managing the Technical Delivery of ASTUTE 2020:

    a. Delegating enquiries from companies as appropriate

    b. Overseeing company projects which will be managed by Senior Project Officers

c. Ensuring administrative procedures are in place and are adhered to

Main Duties

1. Manage a team of up to 5 Senior Project Officers on a day to day basis, in accordance with policies set by the Operation Director.

2. Chair meetings of the local team on weekly/fortnightly basis and report to Operation Director and Operation Manager

3. Develop procedures, databases, forms and other systems for smooth operation of the administration of TD activity.

4. Manage TD administration, possibly via a Grade 7/8 admin coordinator.

5. Plan strategy for approaching companies in Wales for transformational projects.

6. Read all requests for collaboration proposals and advise Director and Operation Manager about suitability for approval.

7. Filter out potential projects with low impact at an early stage and signpost to appropriate other organisations.

8. Monitor progress of the TD team in delivering outputs and results as required by the business plan of that project.

9. Identify opportunities for strategic "exploratory" research projects between HEI partners which can then lead on to potential industrial collaboration with Welsh companies.

10. Identify opportunities for further external funding and assist in bid writing when appropriate.

11. Identify and plan activity to maximise impact in the 2020 REF.

12. Fully engage with the University's Performance Enabling and Welsh language policies

13. Promote equality and diversity in working practices and to maintain positive working relationships.

14. Conduct all activities within the University's environmental requirements as set out in its Sustainability Policy and Environmental Management System, in order to minimise individual and departmental impact.

15. Any other duties as directed by the Operation Director or his/her nominated representative expected within the grade definition.

(viii) ASTUTE 2020 Senior Project Officer

The Role

All project staff will be expected to work with a variety of manufacturing companies (SMEs and larger enterprises) on engineering projects that range from 1-2 days to 3-4 years in length.

Senior Project Officers will take lead responsibility for significant parts of large, industrial R&D projects and/or lead multi projects in their own right. They will produce high quality reports for industrial collaborators and will contribute to the identification of new industrial projects. It is expected that Senior Project Officers will normally be qualified to Doctoral level or higher.

Specific Duties and Responsibilities

- Provide specialist skills in Advanced Manufacturing as described in the ASTUTE 2020 operation at Swansea University and with companies including effective liaison with academic and other staff at all partner institutions in order to achieve the aims of ASTUTE 2020 and to thus deliver collaborative R&D projects.

- Prepare detailed programmes showing activity, financial management, delivery of outputs and monitoring details for the activity being proposed.

- Prepare reports on a quarterly basis showing progress of specific activities, particularly collaborative R&D projects, which make a contribution to ASTUTE 2020 against planned targets, outputs and finance.

- Prepare papers for publication in refereed journals and identify and pursue registration of intellectual property where appropriate.

- Carry out a range of business development activities to help recruit companies to the project and then to liaise with them to prepare detailed programmes of work, monitor progress of project activity and to collect evidence for the delivery of targets and outputs.

- Carry out a range of duties at a strategic and technical level involving visiting companies, attendance at events, presenting at conferences and meetings, hosting visits and giving advice on activities of value to the project and / or the University.

- Liaise with academic and other staff within the University, in Companies, in Partners and other stakeholders in order to ensure consistency and accuracy in the monitoring, reporting and evidence gathering aspects of Collaborative R&D projects.

- Liaise within a team of staff and their research groups assisting with the above tasks.

- Promote environmental sustainability in collaborative R&D projects and other interactions with industry.

- Carry out administrative and other duties commensurate with the post.

- Maintain and enhance links with the professional institutions. A commitment to continuing professional development is mandatory.

General Duties and Responsibilities

This appointment in the School of Engineering has a number of generic objectives common to research appointments. These relate to developing and generating novel research concepts, designs, directions, and outputs in areas related to the ASTUTE 2020 operation.

Senior Project Officers (grade 9) will be expected to:

1. Pro-actively contribute to and conduct R&D, including gather, prepare and analyse data, generate original ideas and present results.

2. Prepare reports, draft patents and papers describing the results of the R&D which may be either confidential or for publication.

3. Be self-motivated, apply and use their initiative, aiming to determine suitable ways to tackle challenges and seeking guidance when needed

4. Interact positively and professionally with other collaborators and partners within the School and elsewhere in the University and beyond in industry and academia.

5. Contribute to School organisational matters in order to help it run smoothly and to help raise its external research profile.

6. Keep informed of developments in the field in technical and specific terms and their wider implication for commercial applications and the knowledge economy.

7. When requested act as a representative or member of committees, using the opportunity to extend their own professional experience.

8. Demonstrate and evidence own professional development, particularly with regard to probation, appraisal, and performance reviews, and participation in training events, in line with the recommendations of the Research Councils' Joint Skills Statement.

9. Maintain and enhance links with the professional institutions and other related bodies.

10. Participate in and undertake other research, development or administrative activities appropriate to their experience and skill, and as directed by the Operation Director or such other person delegated to act with their authority.

11. Observe best-practice protocols in maintenance and retention of research records as indicated by HEI and Research Councils records management guidance. This includes ensuring project log-book records are deposited with the University / Principal Investigator on completion of the work.

12. To promote equality and diversity in working practices and to maintain positive working relationships.

13. To exhibit a degree of independence in terms of specifying the focus and direction of the R&D.

14. To be actively engaged in the writing and publishing of reports and research papers,

particularly those intended for publication in refereed (e.g. international) journals or comparable as a normal part of their role.

15. Be self-motivated, apply and use their initiative, aiming to determine suitable ways to tackle challenges

16. Use creativity to analyse and interpret data and draw conclusions on the outcomes

17. Participate in and undertake other research, development or administrative activities appropriate to their experience and skill, and as directed by the Head of the School or such other person delegated to act with their authority

18. Drive forward and pro-actively conduct R&D, including gather, prepare and analyse data and present results, exhibiting a significant degree of independence in terms of specifying the focus and direction of that research.

19. Prepare reports, draft patents and papers describing the results of the R&D which may be either confidential or for publication. The writing and publishing of research papers, particularly those intended for publication in refereed (e.g. international) journals or comparable is an integral part of the role. At this grade you will be required to develop an extensive track record of publications as the principal author.

20. Be self-motivated, apply and use initiative and problem solving skills to determine research programmes and methodologies, in collaboration with colleagues or the Head of School and others inside and beyond the University.

21. Participate in and develop internal and external networks to build a personal reputation, to identify sources of funding, generate income, obtain consultancy projects or build professional relationships.

22. Contribute to College organisational matters in order to help it run smoothly and to help raise its external profile in the discipline.

23. Manage, direct, or supervise the work of others, for example in research teams or projects.

24. Contribute to the teaching and learning programmes in the College and to supervise postgraduate or project research students where this is consistent with the aims of the project.

This is a fixed term position to 30th June 2020 and the salary will be on the Grade 9 salary scale for Research Staff. The job description sets out the duties of this post as of July 2015, it may be necessary for these duties to be varied from time to time within the grade/profile definition.

(ix) ASTUTE 2020 Project Officer

The Role

All operation staff will be expected to work in teams with other ASTUTE 2020 employees,

academics and company employees with a variety of manufacturing companies (SMEs and larger enterprises) on engineering projects that range from 1-2 months to 2-4 years in length.

Project Assistants at Grade 7 will carry out their own experimental or computer modelling work as part of industrially-focussed R&D projects. They will perform their own analysis and interpretation of results, and will assist with production of reports, Powerpoint presentations and publications as directed by the project leaders. Project Officers at Grade 8 will manage their own technical activities in terms of industrial collaborative R&D projects with a variety of companies.

It is expected that Project Officers will normally have a PhD qualification or equivalent and Project Assistants will normally have at least a good first degree or equivalent and already be working on, or have recently finished a Post-Doctoral Graduate qualification.

Specific Duties and Responsibilities

- Provide specialist skills in Advanced Manufacturing as described in the ASTUTE 2020 operation at Swansea University and with companies including effective liaison with academic and other staff at all partner institutions in order to achieve the aims of ASTUTE 2020 and to thus deliver collaborative R&D projects.

- Prepare detailed programmes showing activity, financial management, delivery of outputs and monitoring details for the activity being proposed.

- Prepare reports on a quarterly basis showing progress of specific activities, particularly collaborative R&D projects, which make a contribution to ASTUTE against planned targets, outputs and finance.

- Prepare papers for publication in refereed journals and identify and pursue registration of intellectual property where appropriate.

- Carry out a range of activities to help recruit companies to the project and then to liaise with them to prepare detailed programmes of work, monitor progress of project activity and to collect evidence for the delivery of targets and outputs.

- Carry out a range of duties at a strategic and technical level involving visiting companies, attendance at events, presenting at conferences and meetings, hosting visits and giving advice on activities of value to the project and / or the University.

- Liaise with academic and other staff within the University, in Companies, in Partners and other stakeholders in order to ensure consistency and accuracy in the monitoring, reporting and evidence gathering aspects of Collaborative R&D projects.

- Liaise within a small team of other staff and their research teams assisting with the above tasks.

- Promote environmental sustainability in collaborative R&D projects and other interactions with industry.

- Carry out administrative and other duties commensurate with the post.

• Maintain and enhance links with the professional institutions. A commitment to continuing professional development is mandatory.

General Duties and Responsibilities

This appointment in the College of Engineering has a number of generic objectives common to research appointments. These relate to developing and generating novel research concepts, designs, directions, and outputs in areas related to the ASTUTE 2020 operation.

A Project Assistant (grade 7) will be expected to:

1. Pro-actively contribute to and conduct R&D, including gather, prepare and analyse data, generate original ideas and present results.

2. Prepare reports, draft patents and or papers describing the results of the R&D which may be either confidential or for publication.

3. Be self-motivated, apply and use their initiative, aiming to determine suitable ways to tackle challenges and seeking guidance when needed

4. Interact positively and professionally with other collaborators and partners within the College and elsewhere in the University and beyond in industry and academia.

5. Contribute to College organisational matters in order to help it run smoothly and to help raise its external research profile.

6. Keep informed of developments in the field in technical and specific terms and their wider implication for commercial applications and the knowledge economy.

7. When requested act as a representative or member of committees, using the opportunity to extend their own professional experience.

8. Demonstrate and evidence own professional development, particularly with regard to probation, appraisal, and performance reviews, and participation in training events, in line with the recommendations of the Research Councils' Joint Skills Statement.

9. Maintain and enhance links with the professional institutions and other related bodies.

10. Participate in and undertake other research, development or administrative activities appropriate to their experience and skill, and as directed by the Head of the College / Institute or such other person delegated to act with their authority.

11. Observe best-practice protocols in maintenance and retention of research records as indicated by HEI and Research Councils records management guidance. This includes ensuring project log-book records are deposited with the University / Principal Investigator on completion of the work.

12. Promote equality and diversity in working practices and to maintain positive working relationships.

13. Fully engage with the University's Performance Enabling policy and Welsh language policy where appropriate.

14. Participate in and undertake other relevant research, development or administrative activities appropriate to their experience and skill, and as directed by the Project Director.

In addition, Project Officers at Grade 8 will be required to:

15. Exhibit a degree of independence in terms of specifying the focus and direction of the R&D.

16. Be actively engaged in the writing and publishing of reports and research papers, particularly those intended for publication in refereed (e.g. international) journals or comparable as a normal part of their role.

17. Be self-motivated, apply and use their initiative, aiming to determine suitable ways to tackle challenges

18. Use creativity to analyse and interpret data and draw conclusions on the outcomes

Appendix XV –Salary Spine Points

Salary Spine Points for each of the Universities can be found on the internet under the hyperlinks below.

Swansea University - Single Spine Points 1 - 51 (From Aug 2015)

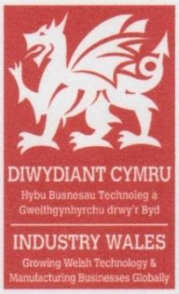
Cardiff University - Single Spine Points 1 - 51 (From Aug 2015)

Aberystwyth University - (From Aug 2015)

University of Wales Trinity Saint David (UWTSD) - (From Aug 2014)

Appendix XVI –Letters of Support from Industry Wales and EEF

Professor Johann Sienz
Director Astute
Room 110,
Digital Technium,
College of Engineering
swansea University
Swansea
SA2 8PP



Waterton Centre
Waterton Industrial Estate
Bridgend
Wales, UK
CF31 3WT

www.industrywales.com
info@industrywales.com

Tel: 01656 658 855
Fax: 01656 679 100

4 August 2015

Dear Hans,

ASTUTE 2020

Thank you for outlining your vision for ASTUTE 2020, and for engaging in a constructive dialogue about shaping of it and the future collaboration between Industry Wales and ASTUTE 2020.

Industry Wales has internally discussed the robust process you have undergone to define the areas of Adaptive Smart Specialisation:

- Computational Engineering Modelling,
- Advanced Materials Technology, and
- Manufacturing Systems Engineering

including looking at historic demand, shaping the partnership to meet this demand based on recognised world class strengths and some highly relevant niche areas. On the basis of the demand review and our own experiences, we believe these areas to be highly relevant to Welsh industry at the moment. We are encouraged by your concentration on utilising and developing recognised areas of expertise.

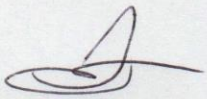
We welcome your plan to review and adapt these areas of smart specialisation during the course of ASTUTE 2020.

This fits in very well with our plans of mapping the Manufacturing industry in Wales, and we would very much like to take up your offer to work with ASTUTE 2020 by taking part in and benefitting from the horizon scanning exercises and other relevant discussions to inform the adaptive element of the smart specialisations. This will help to ensure that the ongoing work of ASTUTE 2020 is of continued relevance to the Welsh Manufacturing industry and generates the further impact needed to move forward at pace.

Industry Wales would like to actively contribute to the running and development of ASTUTE 2020 by being a member of the Stakeholder Advisory Board, providing a necessary industrial perspective, and by being a member of the Project Committee to inform the decision making for project approval and subsequent appraisal.

Industry Wales is very much aware of the successes of the previous programme and is supportive of the new programme ASTUTE 2020. We look forward to a highly engaging and productive collaboration between Industry Wales and ASTUTE 2020.

Yours sincerely



T J Whyatt MBE

Interim CEO , Industry Wales

Registered in England & Wales with limited liability
Registered office: Waterton Centre, Waterton Industrial Estate, Bridgend, CF31 3WT

Ariennir gan Lywodraeth Cymru
Funded by Welsh Government

From: Paul Byard [mailto:PByard@eef.org.uk]

Sent: 08 March 2016 08:55

To: Sienz J.

Subject: Re: ASTUTE 2020

Dear Hans,

thank you for sharing your vision for ASTUTE 2020, and for engaging in a constructive dialogue about shaping ASTUTE 2020 and the future collaboration between EEF and ASTUTE 2020.

EEF is aware of the robust process you have undergone to define the areas of Adaptive Smart Specialisation

- Computational Engineering Modelling,
- Advanced Materials Technology, and
- Manufacturing Systems Engineering

including looking at historic demand, shaping the partnership to meet this demand based on recognised world class strength and some highly relevant niche areas. We are satisfied that these areas are of high relevance to Welsh industry at the moment.

We welcome your plan to review and adapt these areas of smart specialisation during the course of ASTUTE 2020. This fits in very well with our plans of mapping the manufacturing industry in Wales, and we would very much like to take up your offer to work with ASTUTE 2020 by taking part in the horizon scanning exercises and other relevant discussions to inform the adaptive element of the smart specialisations so that the ongoing work of ASTUTE 2020 is of continued relevance to the Welsh manufacturing industry and related aspects, and generates the impact needed to move forward.

EEF would like to actively contribute to the robust running of ASTUTE 2020 giving it a highly relevant industrial perspective by being a member of the Stakeholder Advisory Board and by being a member of the Project Committee to inform the decision making for project approval.

EEF is very supportive of ASTUTE 2020 and we very much look forward to a highly engaging and productive collaboration between EEF and ASTUTE 2020.

Best regards

Paul Byard

Sent from my iPhone

Appendix XVII – Resources by Adaptive Smart Specialisation

In this section we explain how the expenditure we are planning for ASTUTE 2020 will be divided between the three chosen Adaptive Smart Specialisations:

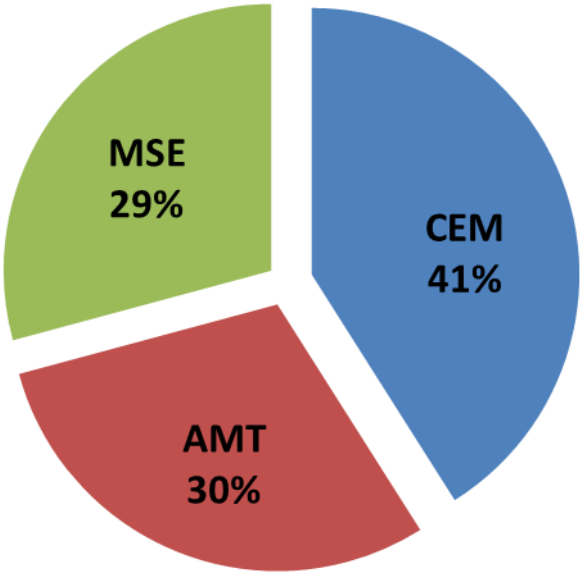
CEM - Computational Engineering Modelling

AMT – Advanced Materials Technology

MSE – Manufacturing Systems Engineering

Under the *Strategic Fit* chapter, we discussed how the original 15 technology areas in the ASTUTE project achieved results and impact (in terms of the ERDF indicators) over the period 2010 to 2015 (Figure 1.1). As the new Adaptive Smart Specialisations are related to some of these technologies we have used this data as a very approximate method to predict the likely relative impact in terms of outputs for each specialisation.

We have thus determined an indicative relative ratio for resource allocation between the three specialisations, as shown in the following diagram. We anticipate this will provide the optimum distribution of resources that will maximise economic impact from ASTUTE 2020.



Based on this ratio, we would expect an approximate distribution of collaborations as follows:

Computational Engineering Modelling	16
Advanced Materials Technology	12
Manufacturing Systems Engineering	12
Total	**40**

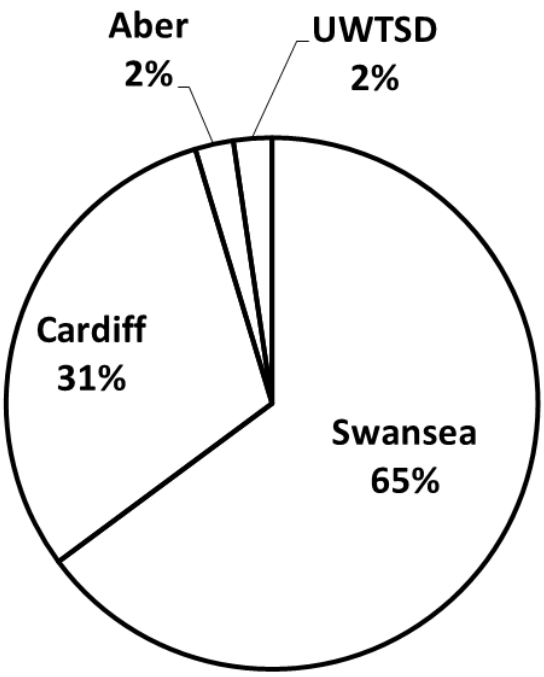
We thus anticipate that Computational Engineering Modelling will require a slightly larger number of R&D collaborations than the other two specialisations. The percentage split in the pie chart above can be used as a broad measure of how we initially plan to divide the technical resources for ASTUTE 2020.

Using these shares for the three specialisations, we have then broken down the percentage for each specialisation between the partners of ASTUTE according to the relative strengths of each institution to give a broad indication of activity split. Thus Swansea will have the greatest proportion of the resources for Computational Engineering Modelling and Advanced Materials Technology, while Cardiff University will have the largest share of the Manufacturing Systems Engineering resources.

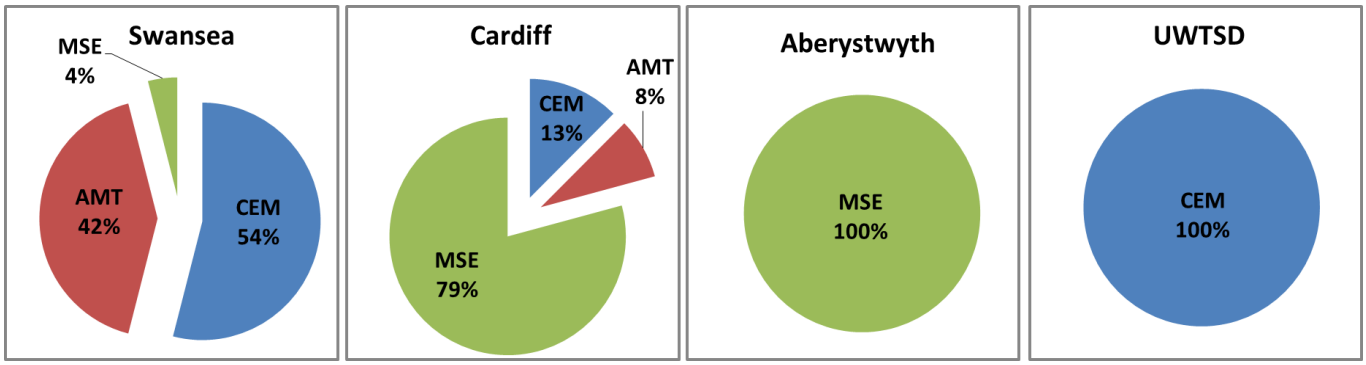
This is shown in the following table, which allows calculation of the overall share of indicative planned resources by each partner in the right hand column.

	CEM	AMT	MSE	Overall Partner Share
TOTAL	41%	30%	29%	100%
Swansea University	35%	27%	3%	65%
Cardiff University	4%	3%	24%	31%
Aberystwyth University	0%	0%	2%	2%
UWTSD	2%	0%	0%	2%

So the relative indicative split of technical delivery resources between the four partners is shown in the pie chart below. Note that this excludes the expenditure associated with the Co-ordination and Support team at Swansea.



The approximate division of planned resources *within* each of the four partners is then shown below:



It is also possible to provide an approximate estimate for how the target levels for the indicators in Chapter 5 could be distributed between the areas of Adaptive Smart Specialisation, based on the planned ratio of resources to be spent on each. Using this approach we have the following prediction:

	TOTAL	CEM	AMT	MSE
Private investment matching public support in innovation or R&D projects	£5,000,000	£2,050,000	£1,500,000	£1,450,000
Number of enterprises receiving non-financial support	42	17	13	12

Number of patents registered for products	5	2	2	1
Number of enterprises supported to introduce new to the firm products	39	16	12	11
Number of enterprises supported to introduce new to the market products	8	3	2	2
Employment increase in supported enterprises	80	33	24	23

We should add that some projects may involve more than one Adaptive Smart Specialisation, making it difficult to allocate the results achieved to each specialisation. It may also be the case that industrial demand will change somewhat over the five years of the proposed operation, therefore the target levels achieved could well be different from those forecast based on prior experience in the table above.

Appendix XVIII – Additional Milestones

To be agreed with WEFO

Information being withheld	**In line with FOIA exemptions:**
ASTUTE 2020 Business Plan: Pages 32, 33, 38,39, 118, 122, 125,126, 127, 128,129,132, 133	Some information is redacted under: • section 40(2) – Personal data exempt from disclosure.
Appendix III Appendix IV Appendix V Appendix XVI	Some information is redacted under: • section 40(2) – Personal data exempt from disclosure.
Appendix XII – Pages 230 - 241	Information is redacted under: • section 42 – Legal professional privilege