MILLER
Research Evaluation Consulting

External Evaluation of IMPACT

Inception Evaluation Report

Swansea University and WEFO

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External Evaluation of IMPACT: Inception Evaluation Report

Sam White, Nick Miller and Adam Greenwood

Miller Research (UK) Ltd.

Pen-y-Wyrlod, Llanvetherine, Abergavenny, Monmouthshire, NP7 8RG, UK
www.miller-research.co.uk | 01873 851880 | Twitter: @miller_research

For further information please contact:

Sam White, Project Manager
sam@miller-research.co.uk

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Glossary

Acronym/Key word	Definition
BRES	Business Register and Employment Survey
CCT	Cross-Cutting Theme
CoE	Swansea University College of Engineering
EAB	External Advisory Board
EPF	Economic Prioritisation Framework
EPSRC	Engineering and Physical Sciences Research Council
ERDF	European Regional Development Fund
ESF	European Social Fund
EU	European Union
GERD	Gross Domestic Expenditure on Research and Development
HEI	Higher Education Institution
IDBR	Inter-Departmental Business Register
IMPACT	Innovative Materials, Processing and Numerical Technologies
Nomis	A service provided by the ONS, to allow access to the UK labour market statistics
ODB	Operational Delivery Board
ONS	Office for National Statistics
R,D and I	Research, Development and Innovations
R&D	Research and Development
REF 2014	Research Excellence Framework 2014
SIC	Standard Industrial Classification
SSG	Scientific Steering Group
SU	Swansea University
TRL	Technology Readiness Level
WEFO	Welsh European Funding Office
WWV	West Wales and the Valleys

Executive Summary

Introduction and background

1.1 This report documents the findings of the Inception Evaluation[1] of the eight-year IMPACT Operation. The Operation is funded by £17.6 million from Swansea University and £17.4 million from the European Regional Development Fund (ERDF) through Welsh Government, at a 49.72 per cent intervention rate.

1.2 The Operation sits within Priority 1, Specific Objective 1.1 of the ERDF Operational Programme, which aims 'to increase the success of Welsh research institutions in attracting competitive and private research funding'.[2]

1.3 The Operation aims to deliver a semi-autonomous Research Institute at Swansea University. The Institute will be a Centre of Excellence for Innovative Materials, Processing and Numerical Technologies.

1.4 The Institute will increase the national and international competitiveness of the College of Engineering to secure significant additional research income, facilitated by academics and researchers conducting research relating to five key themes:

- Future Manufacturing Technologies
- Next Generation Materials Property Measurement
- Advanced Structural Mechanics
- Vapour Deposition Cluster
- Metal Technology Centre

1.5 The Operation has the following principal targets:

- Amount of research funding secured: £24.6 million
- Number of improved research infrastructure facilities: 1 (6,100m^2)
- Number of new researchers: 210

[1] One of three evaluation stages during the course of the Operation. Mid-term and Final Evaluations will follow.
[2] [http://gov.wales/docs/wefo/publications/160917-erdf-operational-programme.pdf] page 35.

- Number of researchers working in improved research infrastructure facilities: 210
- Number of collaborations: 50

About the evaluation

1.6 In May 2017, Miller Research were commissioned to carry out the formative Inception and Mid-Term Evaluations of IMPACT. (A summative Final Evaluation will be commissioned separately, later in the Operation's delivery).

1.7 In short, the aims of the Inception Evaluation are to:[3]

- Conduct a review of evidence of the area of support and assess the fit of the IMPACT Operation within this context.
- Develop, with stakeholders, a logic model to articulate the Theory of Change underpinning the IMPACT Operation.
- Develop an appropriate methodology to assess the progress of the Operation.
- Clarify the data that needs to be collected to enable evaluation of the progress, outputs, outcomes and impacts of the Operation.

1.8 A Mid-term Evaluation is expected to take place during 2018/9. This stage of evaluation will utilise the framework to understand the effectiveness of activities carried out (a formative assessment). Suggestions to improve delivery for the rest of the Operation will be identified.

1.9 A Final (summative) Evaluation will be commissioned separately.

Methodology

1.10 The Inception Evaluation comprised:

- A literature review of documents relating to the strategic context for the Operation.

[3] Refer to Table 1.1 for full description of aims and objectives.

- A review of Operation documentation including the Business Plan, Monitoring and Evaluation Plan, and minutes of meetings.
- Scoping interviews with key stakeholders from within the IMPACT team and Swansea University, as well as external stakeholders, including Welsh Government and WEFO.
- The development of a Logic Model which identifies the causal linkages between intervention and observable outcomes / impacts.
- A workshop with the IMPACT Delivery Team and key stakeholders to scrutinise the Logic Model.
- The development of an evaluation framework which sets out the approach to collecting evidence that will inform the evaluation of the Operation.
- An Impact and Counterfactual appraisal to identify how impacts will be measured and how the additionality of the intervention will be assessed.
- A baseline data analysis which collected available data—according to the impact and counterfactual appraisal—to form a baseline for subsequent comparison.
- A review of the Operation's monitoring and evaluation processes to ensure compatibility with the evaluation framework.
- The preparation of this Inception Evaluation Report and a presentation of findings to the IMPACT Delivery Team and steering group.
- The approach to the Mid-term Evaluation will be finalised during a re-inception meeting at the start of the second evaluation phase.

Logic Model

1.11 A Theory of Change (ToC)[4] approach was used as the theoretical framework to develop the evaluation logic model. The resulting model

[4] C. Weiss (1995). Nothing as Practical as Good Theory: Exploring Theory-Based Evaluation for Comprehensive Community Initiatives for Children and Families (Connell, J, Kubisch, A,

shows the key dependencies in the Operation process, and aims to map out ‘what will happen/happened’ and ‘why’.

1.12 Subsequently, a monitoring and evaluation framework based on HM Treasury’s Green Book guidance was developed.[5] This involved the identification of a process chain of inputs, activities, outputs, interim outcomes and emerging (desired) impacts.

1.13 Then, a set of indicators to link observable outputs, outcomes and eventually impacts to direct and proxy variables were identified. These variables indicate ‘how’ change will be measured.

1.14 Finally, an evaluation framework was developed by identifying questions that need to be answered at each stage of the logic model, to understand what has changed as a result of IMPACT.

1.15 A summary of the monitoring and evaluation framework is included below:

Policy drivers

1.16 To be viable, an intervention must have good strategic fit and align with numerous policies that influence it. At the Inception Evaluation stage, the key questions for the Evaluation Team are: what are the key policies driving the rationale for IMPACT and how closely does IMPACT align with these policy drivers?

Needs

1.17 To justify the use of public funds, it must be possible to demonstrate a clear need/s for an intervention. At the Inception Evaluation stage, the key questions for the Evaluation Team are: what is/are the need/s for IMPACT? How will IMPACT address these needs?

Objectives

Schorr, L, and Weiss, C. (Eds.) ‘New Approaches to Evaluating Community Initiatives’ ed.). Washington, DC: Aspen Institute.

[5] [https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf]

1.18 Objectives are the changes that an intervention is trying to achieve. They drive the activity that is carried out during an intervention, which in turn leads to its outputs, outcomes and impacts. Therefore, the objectives are important in understanding whether the Operation, as designed, will achieve its overall goal.

1.19 At the Inception Evaluation stage, the key questions for the Evaluation Team are: what change is IMPACT trying to achieve? Does this address the needs identified above? To what extent is IMPACT expected to achieve this objective?

Inputs/Resources

1.20 Inputs and resources are what is used by an intervention in its activities. At the Inception Evaluation stage, the key questions for the Evaluation Team are: what inputs/resources are comprised within IMPACT? Are they the right inputs/resources? Are they sufficient for it to achieve its objective?

Activities

1.21 Activities are what an intervention does to achieve its objectives. At the Inception Evaluation stage, the key questions for the Evaluation Team are: what is IMPACT doing with its inputs/resources in order to achieve its objectives? Are these likely to be sufficient for it to achieve its objective?

Outputs

1.22 Outputs are what are produced by an intervention's activities. At the Inception Evaluation stage, the key questions for the Evaluation Team are: what outputs are produced by the Operation? What are the output targets? What is the timescale to reach them? Are they likely to be achievable?

Outcomes

1.23 Outcomes are the short and medium-term results of an intervention's activities. At the Inception Evaluation stage, the main questions for the Evaluation Team are: what are the short and medium-term results

(the outcomes) of IMPACT's activities and outputs? How do they relate to IMPACT's operations? How can we measure them?

Impacts

1.24 Impacts are the longer-term, less-direct results of an intervention. At the Inception Evaluation stage, the main questions for the Evaluation Team are: what are the longer-term results (the outcomes) of IMPACT's activities and outputs, how do they relate to IMPACT's objectives, and how can we measure them?

External factors

1.25 External factors are those factors outside the control of the team delivering an intervention that may influence its outcomes and impacts.

1.26 At the Inception Evaluation stage, the main questions for the Evaluation Team are: what are the external factors that may affect IMPACT's outputs, outcomes and impacts? How may each one affect IMPACT? How is the Operation mitigating them?

Impact and counterfactual options appraisal

1.27 Being able to measure the additionality of an intervention—that is the net-benefit over and above what would have happened anyway (the deadweight or counterfactual) —is a key aspect of an evaluation.

1.28 Although the application of an in-depth impact and counterfactual assessment will be the focus of the final evaluation stage, it is important to understand early on how it will be carried out, so the approach can be validated.

1.29 Thus, at the Inception Evaluation stage, the Evaluation Team considered the most suitable approaches for the IMPACT Operation and presented them to the Delivery Team.

1.30 In summary, the most suitable assessment option varied for each of the expected observable impact indicators. As a result, the suggested impact assessment approach includes a combination of time-bound, control (using industry averages) and self-assessment indicators.

1.31 The main report documents the agreed approach for each indicator and the baseline position—which collects the data for each indicator where applicable—is summarised below.

Baseline Position

1.32 The baseline position is intended to be a reference point from which the impact of IMPACT intervention can be measured against in the future.

IM1 - Development of an internationally-competitive regional advanced engineering cluster

1.33 Metric 1: Agglomeration Effect. To assess the agglomeration effect, employment levels will be monitored at each evaluation stage for size, specialisation and focus. In 2016, the total number of people employed in the advanced engineering sector in the cluster was 1,455, which accounted for 8.8 per cent of employment in advanced engineering in the region, or 27 per cent of all industry employment in the (cluster) area.

1.34 Metric 2: Competitiveness of Cluster: R&D Expenditure (private). National datasets will be used as a control to understand general changes against which observed changes among the treatment group (those engaging with IMPACT) can be compared. The current level of private sector R&D expenditure in Wales as £362 million (a 29 per cent reduction since 2014—private R&D expenditure in Wales in 2014 was £513 million).

1.35 Metric 3: Competitiveness of Cluster: R&D Expenditure (public). The most recent GERD shows the amount of R&D expenditure in 2015 by Government (£13 million) and Higher Education (£286 million).

1.36 Metric 4: Competitiveness of Cluster: Businesses—Market Share. Market share will be measured as the proportion of sector turnover within one area as a share of sector turnover in another area. At present (2017 data) the advanced engineering sector in Swansea (local authority) accounted for a share of 9.5 per cent of the advanced

engineering turnover generated in the wider region (South Wales) and 5.9 per cent of the sector in the whole of Wales.

IM1a—Attraction, development and retention of international industry to the region

1.37 Metric 1 Attraction: Net flow of businesses in the sector. The net flow of businesses into the sector as a percentage change will be used to inform the extent to which businesses have been attracted to the region. The number of businesses increased in the Swansea region (local authority) by 3.4 per cent between 2016 and 2017, the same as the average sector growth rate in Wales, but less than the sector average across the UK (4 per cent) and the wider region (south east Wales—4.8 per cent).

1.38 Metric 2 Development: Change in Average size of businesses. The change in the average size of businesses of those engaging with IMPACT will be monitored and compared with general industry trends using employment numbers and turnover. Within the cluster area, employment increased by 17 per cent (210 additional people in employment), which was notably higher than the average change in employment across the other evaluation areas.

1.39 Metric 3 Retention: Comparison of business birth/death rates. The level of industry retention will be measured by a net business birth / death rate in the cluster area, compared with national trends. The net birth/death rate as a proportion of activity businesses within the UK advanced engineering sector was 6.6 per cent in 2015.[6]

IM1b

1.40 Metric 1: Net Change in Researchers due to IMPACT. The net change in the number of researchers (OP2 & OP3) will be compared with the general employment trend change in the sector (see IM1 Metric 1).

1.41 Metric 2: Proportion of Graduates locating in the region.

[6] For datasets where there is a delay in time periods of publication, trends will have to be considered.

1.42 Metric 3: Average Salary of Cluster. The average salary of the advanced engineering cluster will be collected through a survey of researchers. The mean annual gross pay for the Swansea local authority, as of October 2017, was £23,819. The average (mean) of the advanced engineering sector (using four-digit SIC) across the UK as a whole is £27,378.32.

1.43 Metric 4: Extent to which researchers are world-class. The h-index of new IMPACT researchers will be monitored as papers are published. As such, there is no baseline.

IM2—Driving the economic regeneration agenda (including the Swansea Bay City Regional Deal) through developing and extending the scale of industrial R&D in Wales

1.44 Metric 1: Change in R&D spend by businesses. Please see IM1 Metric 2 & 3 for baseline comparison.

IM3—Increased opportunities for collaboration for other university departments across Wales

Metric 1: Number of collaborations with HEIs. There is no comparison baseline. The counterfactual will be assessed through self-assessment of the extent to which IMPACT influenced collaborations via the external evaluation business survey.

IM4—Increased success of Welsh research institutions in attracting competitive research funding

1.45 The change in research funding among Welsh HEIs can be measured using GERD data. See Table 5.2 and paragraph 5.5 (main report).

IM5—Unintended impacts

1.46 Unintended impacts will be considered as the Operation delivery progresses.

Conclusions and next steps

Policy drivers

1.47 The IMPACT Operation has excellent strategic fit—a view shared by both internal and external stakeholders. The Horizon-Scanning exercise provides further assurance that the strategic fit will remain, within a changing landscape.

Needs

1.48 IMPACT directly addresses the needs of the West Wales and the Valley ERDF Operational Programme. Stakeholders unanimously agreed that there is a need for IMPACT.

Objectives

1.49 Stakeholders were generally confident that the objectives for the IMPACT Operation—as identified in the Business Plan—were valid (in terms of addressing the needs for the Operation) and achievable.

Inputs

1.50 Overall, it seems that the IMPACT Operation has sufficient resources to achieve its objectives (assuming external factors are mitigated for effectively).

Activity

1.51 At this stage it seems that IMPACT has the processes in place in order to achieve its objectives.

Outputs

1.52 Stakeholders were generally confident that IMPACT will achieve its output targets.

Outcomes

1.53 The anticipated outcomes suggest that IMPACT will achieve its objectives, principally increasing the capacity and capability of the CoE so that it can secure £24.6 million of competitive research funding by 2022/23.

Impacts

1.54 Stakeholders seemed confident that thorough planning and flexible delivery (regular horizon-scanning of future funding opportunities and growth areas, especially those that do not require membership of the European Union) will allow the Operation to achieve its objectives.

Impact and counterfactual

1.55 The main challenge of the assessment will be understanding the additionality of IMPACT intervention—especially considering that intervention is at the lower levels (1–3) of the TRL index. This report sets out a detailed approach to address this challenge.

Recommendations

1.56 IMPACT Operation Delivery Team and the external Evaluation Team to monitor data collection systems to ensure data coverage as set out in the evaluation framework in this report.

1. Introduction

1.1 This report comprises the main output of the Inception Evaluation of IMPACT, a European Regional Development Fund (ERDF)-supported Operation based at Swansea University.

About IMPACT

1.2 IMPACT is an 8-year Operation to deliver a semi-autonomous Research Institute at Swansea University. The Institute will be a Centre of Excellence for Innovative Materials, Processing and Numerical Technologies.

1.3 Part of the Institute will be a building that contains laboratory space, collaborative research hubs, formal and informal meeting and networking areas, server and plant rooms, and essential ancillary facilities. It will house academics and researchers from Swansea University's College of Engineering who conduct research relating to five key themes:

- Future Manufacturing Technologies
- Next Generation Materials Property Measurement
- Advanced Structural Mechanics
- Vapour Deposition Cluster
- Metal Technology Centre.

1.4 The Institute's exact research objectives will be determined by a Scientific Steering Group and advised on by external stakeholders from academia, government and industry.

1.5 The IMPACT Operation aims to increase the College of Engineering's national and international competitiveness and so enable it to secure additional research income of £24.6 million.

1.6 It also aims to enhance collaboration between academia and industry and contribute to Welsh Government's target to overcome an identified shortfall of engineering scientists in Wales.

1.7 The IMPACT Operation will be delivered between the years 2015/16 and 2022/23. It has a budget of £35 million, of which £17.4 million is provided by the ERDF and £17.6 million by the College of Engineering at Swansea University.

1.8 The Operation has the following principal targets:

- Amount of research funding secured: £24.6 million
- Number of improved research infrastructure facilities: 1 (6,100m^2)
- Number of new researchers: 210
- Number of researchers working in improved research infrastructure facilities: 210
- Number of collaborations: 50

About the external evaluation of IMPACT

1.9 In May 2017, Swansea University and the Welsh European Funding Office (WEFO) commissioned Miller Research to carry out the formative Inception and Mid-Term Evaluations of IMPACT. (A summative Final Evaluation will be commissioned separately, later in the Operation's delivery.)

Aims and objectives

1.10 The tender specification produced by Swansea University and WEFO listed the following aims and objectives of the two evaluations:

Table 1.1: Aims and objectives of Inception and Mid-Term Evaluations of IMPACT

Inception Evaluation
Conduct a review of evidence of the area of support and assess the fit of the IMPACT Operation within this context
Develop, with stakeholders, a logic model to articulate the Theory of Change underpinning the IMPACT Operation. This will form the basis of the evaluation for the duration of the Operation. The logic model should include, but not exclusively, the policy, programme and economic context of the Operation, the Operations' inputs and activities, identify outputs and anticipated outcomes and impacts. The model should not be confined to the

agreed output indicators. The target demographic group most likely to maximise the outcomes and impact should be identified
Develop an appropriate methodology to assess the progress of the Operation in meeting the aims and objectives set out in the business plan and the outcomes and impacts identified in the theory of change logic model. This should include identification, where possible, of a reasonably robust counterfactual
Clarify: the data that needs to be collected to enable evaluation of the progress, outputs, outcomes and impacts of the Operation, any additional data the Operation needs to collect to achieve this objective
Mid-Term Evaluation
Assess the data collected after the inception evaluation
Use the operational intervention logic model as a base to evaluate the progress and impact of the Operation
Undertake a review of delivery against the Cross Cutting Themes

T53(17) Schedule 1 Part 2—Tender Specification, Swansea University, April 2017

Timetable

1.11 The timetable for the Inception and Mid-Term Evaluations is as follows:

- Inception Evaluation: June to December 2017
- Mid-term Evaluation: November 2018 to September 2019

About this report

This report forms the main output of the Inception Evaluation. The report has the following structure:

- Executive Summary
- Introduction
- Methodology
- Logic Model and Evaluation Framework
- Baseline position
- Conclusions and recommendations

Further information is located in the following annexes:

- References
- Annex A—Stakeholder Interview List
- Annex B—Stakeholder Interview Topic Guide
- Annex C—Stakeholder Workshop Attendee List
- Annex D—Operational Logic Model
- Annex E—Advanced Engineering Sector Definition by Standard Industrial Classification (SIC) Codes

2. Methodology

2.1 This section presents an overview of Miller Research's methodology for undertaking the Inception Evaluation of IMPACT.

Inception Evaluation

2.2 The Evaluation Team developed and agreed the Inception Evaluation methodology during the project Inception Meeting held in June 2017. It was based on the proposal submitted in response to the Invitation to Tender.

2.3 The Inception Evaluation comprised the following research tasks:

Literature review

2.4 Members of the Evaluation Team reviewed literature related to the strategic context for IMPACT. This included:

European-level policy:

- European Regional Development Fund West Wales and the Valleys Operational Programme 2014–20
- Economic Prioritisation Framework for Welsh European Funds
- European Commission's Stairway to Excellence.

Wales-level policy:

- Welsh Smart Specialisation Strategy (found in Innovation Wales and Science for Wales).

Swansea University policy:

- Swansea University 'strategy for research, development and innovation coupled with aligned higher level skill training'.

Policy reviews:

- Encouraging a British Invention Revolution: Sir Andrew Witty's review of universities and growth
- Towards 2030: A framework for building a world-class post-compulsory education system for Wales ('Hazelkorn Review')

- The Review of Higher Education Funding and Student Finance Arrangements in Wales ('Diamond Review')
- Talented Women for a Successful Wales.

Financial instruments/other:

- Engineering and Physical Sciences Research Council
- Innovate UK
- Horizon 2020
- UK Industrial Strategy
- INTTERREG Transnational Programme
- Swansea Bay City Region Deal.

The literature review informed the production of the IMPACT logic model and this report.

Operation documentation review

2.5 Members of the Evaluation Team reviewed documentation related to the IMPACT Operation. This included:

- IMPACT Business Plan (Version 18, November 2016)
- IMPACT Governance (Version 0.2, April 2017)
- IMPACT Monitoring and Evaluation Plan (Version 0.3, May 2017)
- Minutes of the IMPACT Operation Board Meetings
- Minutes of the IMPACT Operational Delivery Board Meetings
- IMPACT Claim to WEFO (February 2017).

The output of both the literature and operation documentations reviews was a slide deck (for internal use by the Evaluation Team). The findings also informed the policy background and needs sections of the logic model.

Scoping interviews

2.6 Members of the Evaluation Team conducted nine interviews with IMPACT stakeholders in late-June and early-July 2017. The

stakeholders were selected in consultation with the IMPACT team. The list of stakeholders interviewed is located in Annex A.

The interviews were qualitative in nature and based on a topic guide agreed with the IMPACT team in advance. The topic guide is located in Annex B.

The Evaluation Team will conduct an interview with IMPACT's Senior Scientific Advisor.

Development of logic model

2.7 A draft logic model was produced by members of the evaluation team, using the findings of the literature and operation documentation reviews. The evaluation team then held an internal workshop at which the model was critiqued and developed.

Further detail about the theory behind the production of the logic model is located in Chapter 3.

Workshop with IMPACT Delivery Team and stakeholders

2.8 In mid-July 2017, the Evaluation Team facilitated a workshop with the IMPACT Delivery Team and wider stakeholders at Swansea University. At the workshop, the draft Logic Model was presented to attendees and explained section-by-section, starting at Impacts and working backwards to Policy Drivers.

The workshop provided an opportunity for stakeholders to sense-check the Evaluation Team's understanding of the Operation and provide further contextual information to inform the development of the model.

Following the workshop, the Evaluation Team integrated the feedback into the draft logic model, which was shared with stakeholders for further scrutiny, before being signed-off by the IMPACT Delivery Team.

The list of stakeholders present at the workshop is located in Annex C.

Evaluation Framework production

2.9 The Evaluation Team produced a draft Evaluation Framework using the agreed logic model. The framework identifies evaluation questions to be asked at the Inception, Mid-Term and Final evaluation stages for each point of the logic model. It also identifies:

- what direct or proxy indicator will provide evidence to enable the question to be answered
- what type of data it comprises (qualitative or quantitative)
- the data source (where the data will come from, for example, a beneficiary survey)
- who will collect it (the Evaluation Team or IMPACT Delivery Team)
- what stage of the evaluation it is required (inception, mid-term, and/or final).

The Framework also integrates elements of the EU Better Regulations Framework, which asks questions to explore the coherence, relevance, effectiveness and efficiency of an intervention.

The draft Evaluation Framework was shared with the IMPACT Delivery Team for comments, before the Evaluation Team produced an agreed version of the Framework (version 1).

The Evaluation Framework and commentary on it is located in Chapter 3.

Impact and counterfactual options appraisal

2.10 The Evaluation Team convened an internal workshop to discuss the Impacts section of the logic model and evaluation framework, specifically asking ‘what indicators can be used—in combination—to show the full extent of the impact of IMPACT?’; so that the true impact of the Operation can be estimated.

The Evaluation Team used the discussion to develop a number of impact options (bundles of quantitative and qualitative indicators), which—when used together—should allow the team conducting the

Final Evaluation (and those conducting the mid-term to understand impacts to date) to present an evidence-based appraisal of the impact of the Operation. The primary aim of this task is to ensure data is collected to allow assessment of the counterfactual—that is, what would have happened in the absence of IMPACT?

Baseline data analysis

2.11 The Evaluation Team conducted an analysis of the existing datasets identified in the impact and counterfactual options appraisal.

The findings of this analysis are located in Chapter 4.

Monitoring and evaluation process review

2.12 A review of existing Operation monitoring and evaluation processes was carried out by the Evaluation Team, to understand the scope and coverage, and specifically how this complemented the data requirements set out in the Evaluation Framework.

Draft Inception Evaluation Report

2.13 The Evaluation Team produced an initial draft inception evaluation report, before sharing it with the IMPACT Delivery Team for comment.

Presentation of initial findings

2.14 The initial findings of the evaluation were presented to stakeholders by the IMPACT Delivery Team in November 2017.

Final Inception Evaluation Report

2.15 The Evaluation Team addressed the feedback received from the IMPACT Delivery Team and stakeholders and produced a Final Inception Evaluation Report.

2.16 The approach for the Mid-Term Evaluation will be confirmed at a Re-Inception Meeting between the Evaluation Team and the IMPACT Delivery Team in late-2018.

3. Logic Model and Evaluation Framework

3.1 This section presents the findings of the Logic Model development and Evaluation Framework development tasks. The two will be considered together as they are closely related.

About logic models

3.2 A logic model is a tool for conceptualising an intervention—a project, programme, operation, or policy. A logic model identifies the causal links between an intervention's inputs and the expected outputs.

3.3 A logic model is frequently produced as part of a programme evaluation because it 'tells the story' of the intervention in an easily-understandable way, and its production—if done in an inclusive manner—provides a useful opportunity to get project stakeholders up to speed with the 'big picture'.

3.4 For the Evaluation of IMPACT, the production of the Logic Model was underpinned by the Theory of Change approach.

About the Theory of Change

3.5 The Theory of Change (Weiss, 1995) approach explains the process of change by outlining causal linkages in an initiative and its short-term, intermediate, and long-term outcomes. The identified changes are mapped in an 'outcomes pathway' to show each outcome in logical relationship to all others, as well as in a chronological sequence. Each link in the chain gives rise to a series of questions relating to the intervention, and these support the design of a comprehensive evaluation framework linked to effective survey instruments.

3.6 The IMPACT Logic Model was developed according to this approach. The Evaluation Team first used the findings of the desk-based review of documentation to frame the market failure that creates the need for publicly-funded interventions such as IMPACT, and then by creating and populating a process chain of inputs, activities, outputs, interim outcomes and emerging (desired) impacts (as recommended in HM

Treasury's Green Book guidance). To capture the full impact of the Operation, the model takes account of long-term impacts and induced impacts arising in addition to the direct impacts of the intervention. It shows the key dependencies in the process and ultimately aims to map out 'what will happen' and 'why'.

About the IMPACT Logic Model

3.7 The IMPACT Logic Model is located in Annex D, and a high-quality version is located at the following address: http://www.miller-research.co.uk/wp-content/uploads/2017/10/IMPACT-Logic-Model-v1.1.pdf

3.8 Within the IMPACT Logic Model, a dotted-blue line frames the IMPACT intervention. Within this sit the activities and expected outputs for which the Delivery Team are directly responsible. Thus, they directly relate to the activity of the Operation.

3.9 A dotted-red line frames the effects of IMPACT. These are the changes that are expected to follow as a result of the intervention. If these changes are correctly monitored and measured, the full impact of the intervention can be understood.

3.10 To ensure a holistic evaluation is carried out, elements of the *EU Better Regulations Framework* have been included in the IMPACT Logic Model. Such elements show the main question that will evaluate key relationships between the sections of the model:

- Coherence—how coherent the Operation is with the policy drivers
- Relevance—the extent to which the Operation's objectives are relevant to the identified needs
- Efficiency—how efficiently the Operation converts inputs into observed effects
- Effectiveness—how effectively the Operation's outputs meets its objectives.

3.11 The IMPACT Operation does not exist in a vacuum and so many external factors will contribute towards changes in indicators during its

delivery (and beyond). The extent to which IMPACT contributes towards observable change that is over-and-above that which would have taken place anyway is termed ‘additionality’ in the HM Treasury Green Book. Essentially, it is the net impact of the intervention after considering what would have happened in its absence (the deadweight or counterfactual). In the Logic Model, this effect is acknowledged by the External Factors reference, which indicates that there will be other factors contributing towards the changes observed. The summative evaluation will focus on determining the extent to which the observed impacts are additional, based on the theory discussed and presented in this report, as the impact and counterfactual options.

About the IMPACT Monitoring and Evaluation Framework

3.12 The IMPACT Monitoring and Evaluation Framework builds on the Logic Model by identifying observable direct and proxy variables, which can be measured during the Operation evaluation.

3.13 A core set of monitoring indicators are ERDF output indicators that are WEFO-approved and some additional reported indicators (identified in the IMPACT Monitoring and Evaluation Plan) that will be included in claims to WEFO. The former are the set of indicators that will ultimately determine the success of the Operation in the eyes of its external funding body.

3.14 However, the full impact of the intervention is expected to be far greater than what these indicators alone will capture. Therefore, the IMPACT Business Plan and Monitoring and Evaluation plan include several additional indicators that are intended to capture the wider impact of the intervention. It is these additional indicators that will be the focus of the external evaluation.

3.15 The Monitoring and Evaluation framework takes each element of the Logic Model and identifies evaluation questions that will need to be answered to understand what has changed as a result of intervention. It then identifies indicators which will enable an assessment of the

extent to which the evaluation question(s) has been met. The potential source of the data is identified and then the person(s) responsible for data collection is specified. Where there are targets set for an indicator, these are also indicated in the framework.

Stage-by-stage explanation of IMPACT Logic Model and Evaluation Framework

3.16 This section of the report, broken down by section of the Logic Model, documents the Evaluation Framework and answers the key evaluation questions. The Framework notes the indicators that collectively answer the evaluation question for each stage of the Logic Model. Then, it notes the evaluation stage where the questions will (primarily) be answered, identifies a source of evidence, and details the responsibility for data collection.

Policy drivers

3.17 To be viable, an intervention must have good strategic fit and align with numerous policies that influence it.

3.18 At the Inception Evaluation stage, the key questions for the Evaluation Team are: what are the key policies driving the rationale for IMPACT and how closely does IMPACT align with these policy drivers? Answering this question will provide an overview of IMPACT's strategic fit. The policies that drive IMPACT are identified in Table 3.1. They were collated by the Evaluation Team through a desk-based review of the Operation's Business Plan and further secondary documentation and consultation with stakeholders. Assessment of the Operation's fit with them is qualitatively assessed below.

Table 3.1: Policy drivers

Policy Drivers What are the key policies driving the rationale for IMPACT? The key policy drivers are…		**Evaluation Question (Section)**
P1	**European-level Policy**	How closely is IMPACT aligned with current policy drivers?
P1a	European Regional Development Fund West Wales and the Valleys Operational Programme 2014-20: Priority 1, Specific Objective 1.1	
P1b	Economic Prioritisation Framework for Welsh European Funds: 'Advanced Manufacturing' thematic opportunity 'Central and South West Wales' regional economic opportunity	
P1c	European Commission's Stairway to Excellence	
P2	**Wales-level Policy**	
P2a	Welsh Smart Specialisation Strategy (found in Innovation Wales and Science for Wales)	
P3	**Swansea University Policy**	
P3a	Swansea University 'strategy for research, development and innovation coupled with aligned higher level skills training'	

Policy Drivers What are the key policies driving the rationale for IMPACT? The key policy drivers are…		Evaluation Question (Section)
P4	**Policy Reviews**	
P4a	Encouraging a British Invention Revolution: Sir Andrew Witty's Review of Universities and Growth	
P4b	Towards 2030: A framework for building a world-class post-compulsory education system for Wales (Hazelkorn)	
P4c	The Review of Higher Education Funding and Student Finance Arrangements in Wales (Diamond)	
P4d	Talented Women for a Successful Wales	
P5	**Financial Instruments/Other**	
P5a	EPSRC Strategic Plan 2015	
P5b	Innovate UK	
P5c	UK Industrial Strategy	
P5d	Horizon 2020	
P5e	INTERREG Transnational Programme	

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Notes: For all Policy Drivers the following applies:

Evaluation Stage	Data Type	Data Source	Data Collection Responsibility
Inception	Qualitative	Desk Research	External Evaluation Team

3.19 European-level policy:

Europe 2020—the EU's growth strategy—identifies innovation as a key measure for achieving 'smart, sustainable, and inclusive growth'. Research, and research and development (R&D) investment are considered a precondition for, and positively associated with, technological innovation. This in turn can, depending on region-specific socio-economic characteristics, be transformed into improved regional economic growth and competitiveness.

'Research and Innovation' is the first of five Priority Axes of the European Regional Development Fund's West Wales and the Valleys (WWV) Operational Programme. The Programme's Priority 1, Specific Objective 1 [P1a] is 'to increase the success of Welsh research institutions in attracting competitive and private research funding'. It has been allocated £96 million in WWV during this funding round. Strategic Objective 1.1 stems from the fact that Welsh institutions attracted 3.3 per cent of UK Research Council funding in 2009/10, when by population share it should be 5 per cent.[7]

The IMPACT Operation strongly aligns with this Objective, as it aims to increase the success of Swansea University to attract competitive research funding—the Operation's principal target is to secure £24.6 million of additional research funding.

3.20 The Operation also closely aligns with the Specific Objective's Target Principles, as shown below:

Table 3.2: Specific Objective 1.1 Targeting Principles

Targeting Principles	IMPACT's Alignment
Must be aligned with Innovation Wales (and Science for Wales) as part of demonstrating smart specialisation.	IMPACT is an example of smart specialisation – the CoE is focusing on its research strengths and investing in them.
Consider links to National Research Networks and Sêr Cymru teams.	IMPACT's semi-autonomous Research Institute will be advised by external academic and governmental stakeholders through an External Advisory Group.

[7] Welsh participation in EU research, innovation and lifelong learning programmes, National Assembly for Wales, European and External Affairs Committee (February 2011), referenced in ERDF West Wales and the Valleys Operational Programme.

Targeting Principles	IMPACT's Alignment
Identify international links / partnerships, including potential transnational activity.	IMPACT will attract international academics and researchers and look to collaborate with multinational companies.
Investments must demonstrate internationally recognised and world-class research excellence.	The Research Excellence Framework 2014 demonstrated Swansea University and its CoE's research excellence.[8]
Must have a clear route to accessing/attracting competitive and private research funding.	One of the main aims of IMPACT is to secure competitive research funding, by increasing the capacity and capability of the CoE.
Particularly encourage opportunities for industrial collaboration and involvement (in particular where private investment can be levered).	IMPACT's strategic research objectives will be determined by a Steering Group advised by stakeholders from industry. The Operation has a target for collaborations.
Links to other programmes should be considered – as a minimum ESF and Horizon 2020.[9]	IMPACT will look to establish links with other ERDF and ESF-funded operations at Swansea University, such as ASTUTE 2020 and the Computational Foundry.

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3.21 The Economic Prioritisation Framework (EPF) supports the delivery of the ERDF WWV Operational Programme by setting EU funding within the broader investment context in Wales. IMPACT could significantly contribute towards the EPF as a 'backbone' or 'core activity', as it will deliver Wales' Knowledge Infrastructure by:

- encouraging collaborative research between academia, research institutions and businesses
- encouraging greater levels of business innovation across all sectors
- targeting capacity building investment relating to the Grand Challenges areas

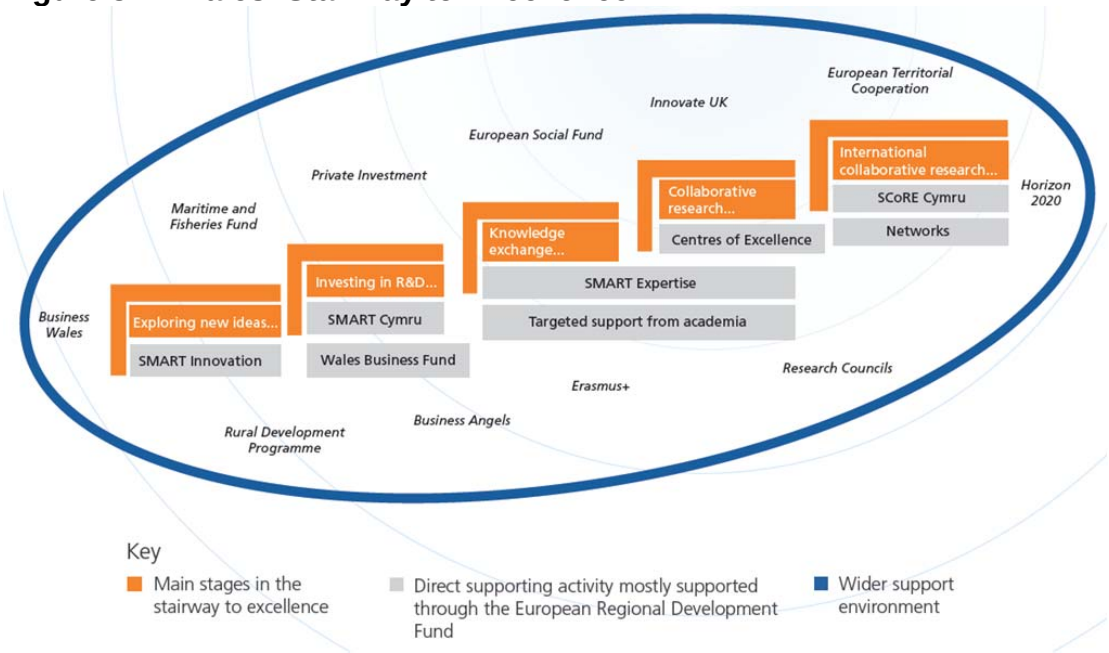
[8] The Research Excellence Framework 2014 showed that 94 per cent of research produced by the CoE's academic staff is of world-leading or internationally excellent quality: http://www.swansea.ac.uk/media-centre/latest-news/swanseauniversityscollegeofengineeringsettoexpandwith18newacademicjobs.php

[9] 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 11.

- targeting investment in development of emerging specialisations and clusters identified through the Smart Specialisation approach in Innovation Wales.

The EPF also identifies seven thematic opportunities—areas for investment identified across Europe, globally and within Wales as key economic opportunities—one of which is the 'Advanced Manufacturing' theme. The Advanced Materials and Manufacturing sector in Wales employs around 150,000 people and turns over £38.6 billion a year.[10] The turnover of advanced manufacturing companies based in Wales also increased far greater than all such UK companies over the past three years (11 per cent annual growth compared to 0.4 per cent decrease).[11] The IMPACT Operation clearly aligns with this thematic opportunity, as it will create a centre of excellence in advanced materials that will provide new employment and collaborate with industry in the region (the Business Plan's Appendix 1.C documents Swansea University's existing relationship with Welsh anchor companies).

Figure 3.1: Wales' Stairway to Excellence



Welsh European Funding Office

[10] http://www.wales.com/business/business-sectors/advanced-materials-manufacturing-amm
[11] Research conducted by the firm Hugh James (2016)

3.22 As a Centre of Excellence, IMPACT fits on the fourth ‘step’ or ‘stage’ of the Wales Stairway to Excellence (S2E), part of an initiative that supports European regions in enhancing synergies in the use of different EU funding sources for research, development and innovation.

3.23 Stakeholders were confident that the Operation fits well with the ERDF Operational Programme and other European-level policy.

3.24 Wales-level policy:

Smart Specialisation is a strategy for research and innovation that prioritises identifying and developing distinct and genuine areas of excellence through the involvement of regional stakeholders, including business and universities.

Wales’ Smart Specialisation Strategy is found in two Welsh Government strategy papers: *Innovation Wales* and *Science for Wales*.

3.25 *Innovation Wales* highlights the need for greater collaboration between business, academia and others who access UK and EU funding streams. It identifies five key themes where Wales needs to improve its performance.

IMPACT addresses the first theme—‘Improving collaboration’—by facilitating private investment in academic research. Based at an HEI, IMPACT also addresses this theme’s second Action Area: ‘Knowledge exchange and commercialisation of R&D will be given a high priority in Wales and will favour a demand led approach’, as the Operation is a clear long-term commitment from Swansea University to these activities. IMPACT also addresses the second (‘Promoting a culture of Innovation’), third (‘Providing flexible support and finance for Innovation’) and fifth (‘Prioritising and creating critical mass’) key themes of Innovation Wales, and the Swansea Bay Campus is mentioned as an example of project that will allow Welsh researchers the ability to compete more successfully for funding.

3.26 *Science for Wales* sets out Welsh Government's strategic agenda for the future of research, science teaching and the commercialisation of research for economic gain in Wales. IMPACT is mainly aligned with the Advanced Engineering and Materials Grand Challenge Area.

Section 3.3 of the Science for Wales document is particularly significant, as it concerns the use of EU structural funds. IMPACT is a clear example of capacity building that will facilitate an 'increase in the industrial and R&D competitiveness of Wales', and 'contribute vitally to making Wales more competitive in research'.[12]

Further information about IMPACT's alignment with these two Welsh Government strategies is available in the Operation's Business Plan, pages 20–23.

3.27 Stakeholders were generally confident that IMPACT aligns with Wales' Smart Specialisation agenda, as it builds on Swansea University College of Engineering's existing strength in the fields of Materials Science and Numerical Modelling for engineering (shown by the REF 2014 results, located in Appendix 4.H of the Operation's Business Plan).

3.28 Stakeholders were confident that IMPACT closely aligns with the University's policies and drivers, not least the pressure for it to 'grow or die'. Stakeholders were also confident that it will also strongly contribute to the College of Engineering's own growth plan, and help it achieve its targets set by the University's Senior Management Team.

3.29 Policy reviews:

Encouraging a British Invention Revolution: Sir Andrew Witty's Review of Universities and Growth, published in October 2013, reiterated the potential for UK universities to enhance economic growth. The growth at the core of the IMPACT Operation an increase in academic and researchers employed by the University—and the establishment and

[12] Science for Wales: A strategic agenda for science and innovation in Wales, Welsh Government, 2012.

intensification of links between academia and industry will, if successfully implemented, support the University in contributing to the principles of the Witty Review.

3.30 Based at an HEI, IMPACT is also secondarily affected by the implications of *Towards 2030: A framework for building a world-class post-compulsory education system for Wales* (the Hazelkorn Review) and the *Review of Higher Education Funding and Student Finance Arrangements in Wales* (the Diamond Review).

3.31 Stakeholders rarely mentioned these policy reviews, perhaps reflecting that they have been integrated into current policy.

3.32 Financial instruments/other drivers:

The Engineering and Physical Sciences Research Council (EPSRC) is one of the most relevant funding instruments to the IMPACT Operation. It is therefore strategically important that the research the Operation undertakes aligns with the EPSRC's priorities, which are set out in its 2015 Strategic Plan and 2016 Delivery Plan. The IMPACT Business Plan (in Appendix 1.E) clearly demonstrates that the Operation's research themes and proposed sub-themes were developed with consideration of the EPSRC's strategic direction.

3.33 Innovate UK, the UK's innovation agency, is another body with whom it is important for IMPACT to maintain a good relationship and align, both for potential funding and support reasons. Again, it is clear that the IMPACT Delivery Team have engaged with and scoped out how the Operation's research themes can align with the Innovate UK Delivery Plan scope areas (as shown by Business Plan Appendix 1.F).

3.34 Horizon 2020, the EU's Research and Innovation programme, is a further important funding source with which it is strategically sensible for IMPACT to align (at least—as noted in the Business Plan—in the short term). Again, the IMPACT Delivery Team's engagement with lead academics from Horizon 2020's thematic areas and mapping of

H2020 pillars against IMPACT's research themes suggests that the Operation is well placed to do this.

3.35 Stakeholders emphasised the importance of IMPACT continuing to engage with and aligning with the EPSRC's priorities, particularly at a time when future access to European Union-linked funding sources is unclear. Less mention was made of Innovate UK and Horizon 2020. Stakeholders were confident that the scoping and mapping work undertaken by the IMPACT Delivery Team is comprehensive, and they emphasised the importance of the Scientific Steering Group undertaking regular horizon scanning.

3.36 The European Territorial Co-operation Operation—also known as Interreg—is a further potential source of funding for IMPACT, though smaller than those above. Again, the IMPACT Delivery Team have mapped the Operation against Interreg programmes, and identified one possible area of alignment.

3.37 The Swansea Bay City Deal provides significant opportunities to the South West Wales region, Swansea University, and IMPACT. A relationship has been established between the City Region and IMPACT, resulting in a letter of support for the Operation from the partnership (Business Plan Appendix 4.G), and a request that the Operation continues to engage with the City Deal's Regional Engagement Team.

3.38 Stakeholders were confident that the City Deal and IMPACT would be mutually beneficial to each other: the City Deal's investment in the region should make it a more attractive place for academics, researchers and business to locate, and IMPACT will increase the competitiveness of the region, stimulating growth.

Needs

3.39 To justify the use of public funds, it must be possible to demonstrate a clear need/s for an intervention.

3.40 At the Inception Evaluation stage, the key questions for the Evaluation Team are: what is/are the need/s for IMPACT? How will IMPACT address these needs? Answering these questions will further provide contribute to an understanding of IMPACT's strategic fit and the rationale behind the Operation.

The needs that drive IMPACT are identified in Table 3.3. They were identified by the Evaluation Team through a desk-based review of the Operation's Business Plan and further secondary documentation and consultation with stakeholders. Below, we consider each of the needs in turn, identifying their roots in policy and setting out how IMPACT will contribute to addressing this need.

Table 3.3: Needs

Needs What is the need for IMPACT? There is a need…		**Evaluation Question (Section)**	**Evaluation Questions**
N1	To increase the success of Welsh research institutions in attracting competitive and private sector-supported research funding	Do these needs justify the intervention (IMPACT)?	Is there a need to / how will IMPACT increase the success of Welsh research institutions in attracting competitive and private sector-supported research funding?
N2	To promote regional economic growth and transformation through focusing on specialisations, differentiation, and exploiting economies of scale		Is there a need to / how will IMPACT promote regional economic growth and transformation through focusing on specialisations, differentiation, and exploiting economies of scale?
N3	To ensure cooperation between the public and private sector and collaboration between enterprises and researchers		Is there a need to / how will IMPACT ensure cooperation between the public and private sector and collaboration between enterprises and researchers?

Needs What is the need for IMPACT? There is a need…		Evaluation Question (Section)	Evaluation Questions
N4	To develop and seed technology transfer and knowledge exchange between academia and industry		Is there a need to / how will IMPACT develop and seed technology transfer and knowledge exchange between academia and industry?
N5	To build the capacity and capability of Welsh research institutions and address other barriers to them successfully accessing competitive research funds		Is there a need to / how will IMPACT build the capacity and capability of Welsh research institutions and address other barriers to them successfully accessing competitive research funds?
N6	To increase the specialised research infrastructure where this can clearly demonstrate that it will increase the capacity and capability to undertake world class research, encourage inward investment and develop existing and emerging capability		Is there a need to / how will IMPACT increase the specialised research infrastructure where this can clearly demonstrate that it will increase the capacity and capability to undertake world class research, encourage inward investment and develop existing and emerging capability?
N7	To develop or strengthen world-class excellence (e.g. through Smart Specialisation and identified in Science for Wales)		Is there a need to / how will IMPACT develop or strengthen world-class excellence (e.g. through Smart Specialisation and identified in Science for Wales)?
N8	To contribute to the delivery of the College of Engineering's Strategic Delivery Plan		Is there a need to / how will IMPACT contribute to the delivery of the College of Engineering's Strategic Delivery Plan?

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Notes: For all Needs the following applies:

Evaluation Stage	Data Type	Data Source	Data Collection Responsibility
Inception	Qualitative	Interviews with strategic stakeholders & Desk research	External Evaluation Team

3.41 Need 1—to increase the success of Welsh research institutions in attracting competitive and private sector-supported research funding—is identified in the ERDF West Wales and the Valleys Operational Programme as Specific Objective 1.1. The need is based on the fact that in 2009/10 Welsh research institutions attracted 3.3 per cent of UK Research Council funding, whereas by population share it should attract 5 per cent. The securing of research funding by research institutions and demonstration of research excellence attracts business, the development of clusters, and private-sector funding.[13] The IMPACT Operation and its activities directly address this need, and accordingly one of its output indicator targets is 'amount of research funding secured: £24.6 million'.

Stakeholders agreed that this was a need underpinning IMPACT, and identified a number of UK research institutions with whom Swansea University's College of Engineering and IMPACT is in close competition to secure competitive funding: University of Oxford, University of Cambridge, Imperial College London, University of Sheffield, University of Bristol, and Cardiff University.

3.42 Need 2—to promote regional economic growth and transformation through focusing on specialisations, differentiation, and exploiting economies of scale—has its basis in Wales's Smart Specialisation Strategy and the relative weakness of the West Wales and the Valleys region surrounding research and development investment. In 2011, investment in R&D accounted for 0.96 per cent GVA in WWV, compared to 1.79 per cent in the UK.[14] Unsurprisingly, within WWV, 98 per cent of research income is concentrated in Swansea, Aberystwyth and Bangor.[15] As such, it is vital that these research hubs continue to grow, attract increased research income, and contribute to economic growth of the region. The IMPACT Operation addresses this need by adopting a Smart Specialisation approach—doing more of what the College of Engineering is best at doing. As indicated in the Business Plan, 94 per cent of research produced by the College's high-

[13] West Wales and the Valleys ERDF, pg.31.
[14] Ibid.
[15] Ibid., pg. 35.

impact research groups of Material Science and Numerical Modelling for engineering was deemed of *world leading* (4*) or *internationally excellent* quality in the REF 2014.[16]

Stakeholders agreed that this was as valid need for IMPACT, and one commented that IMPACT has the potential to be a seed of a cluster of advanced materials companies near Swansea.

3.43 Need 3—to ensure cooperation between the public and private sector and collaboration between enterprises and researchers—has its basis in the need to stimulate and support businesses in Wales to invest in R&D. In 2012, Wales had the lowest level of expenditure on R&D of all regions in the UK, but it was identified by the 2017 Regional Innovation Scoreboard as a 'strong innovator' and ranked 54 of the EU28's 220 regions.[17] The IMPACT Operation will address this need by developing a research environment that is driven by intensive collaboration between industry and academia, through:

- input into its strategic research objectives from an External Advisory Board
- co-location of industry-employed researchers at the research institute
- creation of a Collaborative Research Hub at the institute to provide desk and office space to industry.

Stakeholders agreed that there is a strong need for IMPACT to drive cooperation between industry and academia, particularly in the areas of basic materials, steel, titanium and metal fabrication. The Operation's plans to work with Tata Steel were praised. One stakeholder noted that it is important that EU-funded Operations such as IMPACT do not solely focus on increasing R&D in SMEs, but instead that they work with large businesses and multi-national companies that can have a great impact on the supply chain in Wales.

[16] IMPACT Business Plan, pg. 5.
[17] Regional Innovation Scoreboard 2017https://ec.europa.eu/growth/industry/innovation/facts-figures/regional_en

3.44 Need 4—to develop and seed technology transfer and knowledge exchange between academia and industry—has similar roots as Need 3.

3.45 Need 5—to build the capacity and capability of Welsh research institutions and address other barriers to them successfully accessing competitive research funds—is closely related to Need 1. Increasing the capacity and capability of research institutions should increase their success at attracting competitive research funding, and IMPACT will increase the capacity and capability of the College of Engineering.

3.46 Need 6— to increase the specialised research infrastructure where this can clearly demonstrate that it will increase the capacity and capability to undertake world class research, encourage inward investment and develop existing and emerging capability—is closely related to Need 5. An increase in specialised research infrastructure increases the capacity of a research institution and encourages inward investment. The IMPACT Operation will address this need by providing a new specialist building for research and equipment to equip its flexible laboratories.

3.47 Need 7—to develop or strengthen world-class excellence (for example, through Smart Specialisation and identified in Science for Wales)—is closely related to Need 2.

3.48 Need 8—to contribute to the delivery of the College of Engineering's Strategic Delivery Plan—refers specifically to the need for the College of Engineering to grow in order to align with wider Swansea University strategy. Stakeholders were confident that IMPACT plays a significant role in the College's Strategic Delivery Plan, and that successful delivery of it will significantly boost the College and the University.

3.49 As part of the Mid-Term and particularly the Final Evaluation, the Evaluation Team will consider whether the needs for IMPACT are the same as identified above, and—if there are any changes—assess the impact of this upon the Operation and suggest how it should adapt.

Objectives

3.50 Objectives are the changes that an intervention is trying to achieve. They drive the activity that is carried out during an intervention, which in turn leads to its outputs, outcomes and impacts. Therefore, the objectives are important in understanding whether the Operation, as designed, will achieve its overall goal.

3.51 At the Inception Evaluation stage, the key questions for the Evaluation Team are: what change/s is IMPACT trying to achieve? Do these address the needs identified above? To what extent is IMPACT expected to achieve this objective? Answering these questions will further provide contribute to an understanding of IMPACT's strategic fit and the rationale behind the Operation.

The objectives of IMPACT are identified in Table 3.4. They were identified by the Evaluation Team through a desk-based review of the Operation's Business Plan and consultation with stakeholders. Below—rather than consider each objective in turn—we provide an overall assessment of stakeholders' views on the extent to which IMPACT's objectives are appropriate and the extent to which they will be achieved. We also provide further information about the Operation's ERDF targets.

Table 3.4: Objectives

Objectives What change is IMPACT trying to achieve?		**Evaluation Question (Section)**	**Evaluation Question**
OB1	To build the capacity and to extend the capability of fundamental research and development in the Advanced Engineering and Materials 'Grand Challenge' specialisation priority	Do IMPACT's objectives address the needs?	To what extent will / is IMPACT expected to build the capacity and to extend the capability of fundamental research and development in the Advanced Engineering and Materials 'Grand Challenge' specialisation priority?
OB2	To build capacity and secure long-term sustainability through the infrastructure and design of the new facility		To what extent will / is IMPACT expected to build capacity and secure long-term sustainability through the infrastructure and design of the new facility?
OB3	To enable a streamlined specialisation in the Key Enabling Technologies of Advanced Engineering and		To what extent will / is IMPACT expected to enable a streamlined specialisation in the Key Enabling

Objectives What change is IMPACT trying to achieve?		Evaluation Question (Section)	Evaluation Question
	Materials and in numerical technologies for engineering sciences in order to develop and promote fundamental research excellence in the targeted fields of Materials Science and Numerical Modelling for engineering aligned to Swansea University's REF recognised areas of excellence, increase research outputs (including research papers and case studies), and secure an additional £24.6m of competitive funding		Technologies of Advanced Engineering and Materials and in numerical technologies for engineering sciences in order to develop and promote fundamental research excellence in the targeted fields of Materials Science and Numerical Modelling for engineering aligned to Swansea University's REF recognised areas of excellence, increase research outputs (including research papers and case studies), and secure an additional £24.6m of competitive funding?
OB4	To address barriers to Welsh research institutions (not just HEIs) successfully accessing competitive research funding by intensifying existing, and creating new, collaborations with MNEs, MMEs, SMEs, Regionally Important Companies and Anchor Companies		To what extent will / is IMPACT expected to address barriers to Welsh research institutions (not just HEIs) successfully accessing competitive research funding by intensifying existing, and creating new, collaborations with MNEs, MMEs, SMEs, Regionally Important Companies and Anchor Companies?
OB5	To maximise opportunities through enhanced research capability and the targeting of funding opportunities advised by industry stakeholders working in conjunction with academics and building upon existing relationships across two critical research fields in line with the Smart Specialisation strategy		To what extent will / is IMPACT expected to maximise opportunities through enhanced research capability and the targeting of funding opportunities advised by industry stakeholders working in conjunction with academics and building upon existing relationships across two critical research fields in line with the Smart Specialisation strategy?
OB6	To demonstrate a clear route along, and to feed into, the 'stairway of excellence' in identifying new international partners and collaborating with existing international partners to apply for significant additional competitive funding		To what extent will / is IMPACT expected to demonstrate a clear route along, and to feed into, the 'stairway of excellence' in identifying new international partners and collaborating with existing international partners to apply for significant additional competitive funding?

Objectives What change is IMPACT trying to achieve?		Evaluation Question (Section)	Evaluation Question
OB7	Targets: Amount of research funding secured: £24.6 million Number of improved research infrastructure facilities: 1 (6,100m^2) Number of new researchers: 210 Number of researchers working in improved research infrastructure facilities: 210 Number of collaborations: 50		How effectively do you think IMPACT will achieve these targets? Which pose the greatest challenge / will be most difficult to achieve? Which are the most important to the success of the Operation as a whole

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Notes: For all Objectives the following applies:

Evaluation Stage	Data Type	Data Source	Data Collection Responsibility
Inception	Qualitative	Interviews with strategic stakeholders & desk research	External Evaluation Team

3.52 With regards to the Operation's targets:

- **Amount of research funding secured: £24.6 million.** Stakeholders described this target as a 'big number', but they were largely confident that it was achievable, given the emphasis given to IMPACT by the College, rigorous planning ('every square metre of lab space has a target attached to it') and the fact that major external factors, such as Brexit, have (as far as is possible) been accounted for (see External Factors section).

- **Number of improved research infrastructure facilities: 1 (6,100m^2)**. This target will be claimed when the building is completed. Stakeholders were confident that the IMPACT building will be successfully delivered, though there was acknowledgement that construction timeframes may change when the external contractor delivers the detailed construction programme, and during construction, should unforeseen issues arise.
- **Number of new researchers: 210.** This target does not differentiate between academics and researchers. A phased approach to recruitment of academics will be adopted, with approximately 10FTE recruited per year until the full cohort are in place. This phased approach will allow the College to recruit in alignment with the most up to date research priorities. Some academics were appointed to the CoE during the Operation's Mobilisation Phase, before the IMPACT Operation received full approval, but to work within IMPACT's research themes in readiness for its sign-off. Those academics will therefore be claimed towards this target.

  The academics will be supported by postgraduate research staff (15 Senior Research Fellows and 140 Junior Research Officers). Funding for employing these researchers will mostly come from the research funding secured by the new academics. Wording linking new appointments to IMPACT will be included in jobs descriptions, jobs adverts, and contracts (except for those appointed pre-business plan sign-off for whom a letter shall be provided from the Head of the CoE as confirmation of their appointment to IMPACT).

  Stakeholders were confident that this target is achievable, thanks to the attractiveness of the new IMPACT building and other investments on the Bay Campus, good links with Sêr Cymru II, and the strength of the CoE's recruitment department. Stakeholders noted that academics may well bring a team of researchers (and possibly funding) with them to IMPACT when recruited, and that recruitment will take a phased approach.
- **Number of researchers working in improved research infrastructure facilities: 210**. This target can be claimed when the building is complete

and occupied, and it can include both newly appointed and existing researchers.

- **Number of collaborations: Enterprises: 50.** The Welsh European Funding Office counts any enterprises involved in putting forward a funding application, regardless of whether it is successful. Stakeholders were confident that industry will be attracted to collaborate with IMPACT, and commented positively on the most-developed collaboration so far—that with Tata Steel. Stakeholders emphasised the need for IMPACT and other interventions to work with major companies in Wales.

Inputs/Resources

3.53 Inputs and resources are what is used by an intervention in its activities.

3.54 At the Inception Evaluation stage, the key questions for the Evaluation Team are: What inputs/resources are comprised within IMPACT? Are they the right inputs/resources? Are they sufficient for it to achieve its objective?

The IMPACT Operation's inputs/resources are identified in Table 3.5. They were identified by the Evaluation Team through a desk-based review of the Operation's Business Plan, and assessed by stakeholders through qualitative interviews. Below, we summarise each input/resource, assess its suitability, and provide stakeholders' views on the extent to which the inputs/resources are sufficient for the Operation to achieve its objectives.

Table 3.5: Inputs

Inputs/Resources What is IMPACT inputting in order to achieve the objectives?		Evaluation Question (Section)	Evaluation Question
IN1	**Finance**	Does IMPACT have the necessary inputs/resources to achieve its objectives?	Is the finance available to IMPACT sufficient for it to achieve its objectives?
IN1a	£17.6 million from Swansea University		
IN1b	£17.4 million from ERDF at 49.72% intervention rate		
IN2	**Human Capital**		Is the human capital available to IMPACT sufficient for it to achieve its objectives?
IN2a	Operation Delivery Team		Is the Operation Delivery Team made up of the right people? [prompt with list of people]
IN2b	Operational Activity and Management Support		Are the Operational Activity and Management Support teams made up of the right people?
IN2c	High-impact Research Activity Support		Is the High-impact Research Activity Support Team made up of the right people?
IN3	**Skills and Knowledge**		Has the IMPACT Operation acquired the right skills and knowledge to achieve its objectives? [for both academics / researchers and those delivering the Operation]
IN3a	Synergies with: Other Swansea University ERDF and ESF Operations Other ERDF and ESF Operations Innovate UK		What synergies exist between IMPACT and…?
IN4	**Assets**		Are the assets available to IMPACT sufficient for it to achieve its objectives?
IN4a	Swansea University Bay Campus		
IN4b	College of Engineering's existing equipment		
IN5	**Governance**		Are the governance arrangements suitable to support IMPACT to achieve its objectives?
IN5a	University-level Governance		Are the university-level governance arrangements sufficient?

Inputs/Resources What is IMPACT inputting in order to achieve the objectives?		Evaluation Question (Section)	Evaluation Question
IN5b	Operation Board		Is the Operation Board made up of the right people? [Prompt with list of board members]
IN5c	Scientific Steering Group		Is the Scientific Steering Group made up of the right people? How will it steer the Operation? How has it steered the Operation? Is it effective? [Prompt with list of steering group members]
IN5d	External Advisory Board		What role will the External Advisory Board occupy? What impact do you expect the board will have on the Operation?
IN6	**Intended beneficiaries**		Who are the intended beneficiaries of IMPACT?
IN6a	Academics working at Swansea University or other HEI		
IN6b	Researchers working at Swansea University or other HEI		
IN7	**Management––processes of planning and delivering**		Are the management processes suitable for IMPACT to achieve its objectives?
IN7a	Operational Delivery Board		Is the Operation Delivery Board made up of the right people?
IN8	**Business Plan: v18**		Is the Business Plan suitable for the IMPACT to achieve its objectives?
IN9	**Communications and marketing / awareness raising plan**		Is the communications and marketing/awareness raising plan sufficient for IMPACT to achieve its objectives?
IN10	**Monitoring and evaluation processes**		Are the monitoring and evaluation processes suitable?
IN10a	Monitoring and Evaluation Plan		
IN10b	External Evaluation: Inception and Mid-Term; Final		

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Notes: For all Inputs the following applies:

Evaluation Stage	Data Type	Data Source	Data Collection Responsibility
Inception	Qualitative	Interviews with strategic stakeholders	External Evaluation Team

3.55 The 8-year IMPACT Operation is funded by £17.6 million from Swansea University and £17.4 million ERDF through Welsh Government, at a 49.72 per cent intervention rate. Stakeholders were generally confident that the level of funding available to IMPACT was sufficient for it to achieve its objectives. In the longer term (post ERDF-funding), stakeholders were confident that the Operation would continue to have the (non-financial) support of Welsh Government.

3.56 The IMPACT Operation is delivered by an Operation Delivery Team, and a High-impact Research Activity Support team. Stakeholders were confident that the people were suitable for their roles and had the skills and knowledge to undertake them effectively, especially those with current and past experience of delivering other ERDF Operations, such as ASTUTE 2020.

3.57 Much of the skills and knowledge available to IMPACT is provided through synergy with other ERDF and ESF operations at Swansea University. Stakeholders were aware and keen to exploit the potential synergies between IMPACT and these other ERDF and ESF operations, as well as those elsewhere in West Wales and the Valleys and elsewhere in Wales. They were confident that these synergies would be realised, through effective communications between the Delivery Teams of the various operations. Stakeholders specifically mentioned the Computational Foundry and SPECIFIC as two ERDF operations at Swansea University with high potential for synergy with IMPACT.

3.58 Four groups/bodies of governance oversee IMPACT: Swansea University-level governance, an Operation Board, a Scientific Steering Group, and an External Advisory Board. Again, stakeholders were confident that the governance arrangements will provide IMPACT with a solid steer. They also placed emphasis on the importance of recruiting the right person as Senior Scientific Advisor, suggesting that this person should be someone who can help the Operation 'open doors'.

3.59 The intended direct beneficiaries of IMPACT are the academics and researchers employed by the College of Engineering.

3.60 Management of IMPACT is undertaken by the Operation Manager and other officials who comprise the Operational Delivery Board (ODB), which met fortnightly in the early stages of the Operation and now meets monthly. Stakeholders were satisfied that the ODB is made up of the right people and meets sufficiently regularly to manage the Operation effectively.

3.61 The Operation is underpinned by its Business Plan, version 18 of which was approved by WEFO in late-2016. The Business Plan is comprehensive, evidence-based, and clearly structured.

3.62 A Marketing and Communications Plan was submitted to WEFO in April 2017. A Marketing Officer was appointed to the Operation in July 2017.

3.63 A Monitoring and Evaluation Plan was developed in the spring of 2017. The Inception and Mid-Term External Evaluations were procured in May 2017. The External Final Evaluation will be procured separately, later in the Operation's delivery. An Evaluation Steering Group oversees the Evaluations.

Activities

3.64 Activities are what an intervention does to achieve its objectives.

3.65 At the Inception Evaluation stage, the key questions for the Evaluation Team are: what is IMPACT doing with its inputs/resources in order to achieve its objectives? Are these likely to be sufficient for it to achieve its objective?

The IMPACT Operation's activities are identified in Table 3.6. They were identified by the Evaluation Team through a desk-based review of the Operation's Business Plan and discussion with stakeholders in interviews and at a workshop. Below, we summarise each activity (or group of activities), assess whether they are sufficient for the Operation to achieve its objectives, and provide stakeholders' views on this, where appropriate.

Table 3.6: Activities

Activities What is IMPACT doing with the inputs in order to achieve the objectives?		**Evaluation Question (Section)**	**Evaluation Question (Number)**	**Evaluation Question**
A1	**Spend over 8-year delivery (2015/16 to 2022/23)**		A1	What is the spend profile over the 8 years of IMPACT's delivery?
A1a	Development and Initial Delivery Phase (September 2015 to Q2 2019)			
A1b	Delivery and Exit Strategy Phase (Q2 2019 to June 2023)			
A2	**Project Administration**		A2	How will IMPACT be administered?
A2a	Strategic governance - activities of External Advisory Board, Operation Board, SSG etc.			
A2b	Activity of Operation Activity and Management Support Staff			
A3	**Knowledge transfer / application**		A3	How will knowledge transfer occur?
A4	**Monitoring and Evaluation**		A4	

Activities What is IMPACT doing with the inputs in order to achieve the objectives?		Evaluation Question (Section)	Evaluation Question (Number)	Evaluation Question
A4a	Internal Monitoring Activity by Operation Activity and Management Support Staff			What monitoring and evaluation processes will take place?
A4b	External Evaluation by Miller Research (Inception and Mid-Term)			
A5	7 Delivery Workstreams: Delivery of Physical Infrastructure Recruitment of academics Establish IMPACT Delivery Team Identify research equipment Generate research income and deliver research Establish and intensify academic and industrial links Co-location of Tata Steel employees at Swansea University		A5	How will IMPACT deliver its 7 Delivery Workstreams?
A6	**Communications and marketing / awareness raising plan**		A6	How will IMPACT be marketed?
A7	Address Cross-Cutting Themes: Equal opportunities and gender mainstreaming Sustainable development Tackling poverty and social inclusion		A7	How will IMPACT address WEFO's Cross-Cutting Themes?

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Notes: For all Activities the following applies:

Evaluation Stage	Data Type	Data Source	Data Collection Responsibility
Inception & Mid-Term	Qualitative	Review of Operation Documentation & Stakeholder Interviews	External Evaluation Team

3.66 The eight years of IMPACT's delivery (2015/16 to 2022/23) comprise two broad phases: Development and Initial Delivery (up to delivery of the building, due in 2019) and Delivery and Exit. Apart from delivery of the building, £4 million has been earmarked for the provision of research equipment, and, by May 2017, equipment purchases to the value of £1,015,000 were approved. Equipment purchases are overseen by the Scientific Steering Group and College Executive Board. Stakeholders commented that this equipment-fund is an important feature in terms of attracting academics to IMPACT.

3.67 IMPACT is administered and managed by the Operational Delivery Board. The minutes of the meetings of the Board suggest that it effectively manages the Operation and pro-actively addresses issues which arise. Stakeholders were satisfied that the Board comprises the right people and meets effectively.

The Scientific Steering Group (SSG) provides strategic input to the Operation, particularly in terms of its research strategy. Its role is one of horizon scanning, and in particular assessing IMPACT's potential for involvement in funding calls. The Group includes leaders of each of the five High Impact Research Groups, as well as representatives of the wider College.

The External Advisory Board (EAB) will be chaired by the Senior Scientific Advisor and will provide independent advice to the SSG as to how best IMPACT can align with industrial demands and funding calls. The EAB will meet annually or more frequently if required. It is important that the EAB is a dynamic and well-informed body, particularly if the Operation is to have an impact on the wider Swansea region, as hoped.

3.68 Monitoring and evaluation of the Operation has both internal and external aspects. Clear and close communication between these aspects will enable the external evaluations to be as useful (formative) as possible and capture the full impact of the Operation (summative).

3.69 The IMPACT Operation has seven delivery workstreams:

- **Delivery of physical infrastructure.** Kier will fulfil the design and build contract for IMPACT. Construction should begin before the end of 2017, and the building is scheduled for completion in Q2 2019. Stakeholders were aware that construction timescales often slip and costs increase. However, it is hoped that the issues faced by the neighbouring Computational Foundry Operation (unanticipated increases in construction costs) have provided lessons-learnt to IMPACT and that IMPACT might benefit from a more stable environment (for example, concerning Brexit).
- **Recruitment of academics.** As previously mentioned, a phased approach is being taken to recruitment. Stakeholders were confident that a new approach to recruitment—specifying individual posts that arise from a research committee, then cross-checking this against learning and teaching colleagues, before advertising for the post in a focused-way—will be successful.
- **Establish IMPACT Delivery Team.** This is complete apart from the recruitment of a replacement for the Marketing Officer who has resigned.
- **Identify research equipment.** £4 million (£3.5 million plus £500,000 for a high-performance computing cluster) has been allocated to purchase research equipment. The High Impact Research Group leaders have identified the specialist laboratories required to work within the Operation's main research themes. Equipment purchases are reviewed and approved by the Scientific Steering Group.
- **Generate research income and deliver research.** Ultimately, this is the headline aim of IMPACT and what judgement of its success

will be based upon. Research income will principally be generated by the 65 newly-appointed research academics and their Senior Research Fellows. They will be supported in producing grant applications by the CoE's research hub. In 2013–14, the funding rate for EPSRC research proposal was 32 per cent by number and 36 per cent by value. As such, it is anticipated that IMPACT academics will have to apply for approximately £80–100 million of grants, in order to achieve its target.

The IMPACT Operation will conduct research in five core research groups, which are underpinned by the fundamental research themes of 'materials science' and 'numerical modelling':

- Next generation materials property measurement
- Future manufacturing technologies
- Vapour deposition cluster
- Advanced structural mechanics
- Metal technology centre

It is expected that new academic research groups will form around these core groups, resulting in cross-disciplinary working.

The core research groups were chosen through consultation with stakeholders (high impact research group leaders within the CoE), assessment of the REF research strength of the CoE, and research into the future direction of EPSRC and other funding sources.

Stakeholders were confident that the research groups chosen were suitable, but also emphasised that they are broad and flexible, and the Scientific Steering Group will play a critical role in setting the institute's research direction in the future.

- **Establish and intensify academic and industrial links.** The research academics will intensify links with other academic institutions and industry later in the Operation's delivery. The External Advisory Board will also help develop these links. (The

Operation's Business Plan identifies R,D&I capabilities in Wales outside Swansea where synergies exist with IMPACT).

- **Co-location of Tata Steel employees at Swansea University.** A team of Tata Steel employees (researchers from the Tata Technology Centre) will relocate to the Metal Technology Centre in IMPACT to conduct research at Technology Readiness Levels (TRL) 1 to 3. In order to arrange this, a number of meetings have taken place between representatives of IMPACT and Tata Steel, and a Memorandum of Understanding has been signed to document the agreement.

3.70 Information about the communications and marketing activity for IMPACT is contained in its Marketing and Business Plans. As part of this, a bilingual website will be created as a sub-page of the College of Engineering, and Technology Awareness Events will be held once the institute is open.

Cross-Cutting Themes

3.71 The IMPACT business plan notes: 'Whilst there are no specific Cross Cutting Themes (CCTs) indicators and targets for this Strategic Objective, Swansea University is committed to an integrated approach to the Cross-Cutting Themes as an integral part all of its ERDF and ESF funded operations'.[18]

3.72 The University already has well-developed governance structures and policies which are relevant to CCTs as follows:

- Equal Opportunities Committee
- Safety, Health and Environmental Committee
- Human Resources Policy Committee
- Recruitment and Admissions Committee
- Welsh Language Strategy Group
- Finance Committee.

[18] IMPACT Business Plan, page 46.

3.73 The Business plan also notes that: ‘Swansea University proactively promotes widening access ensuring that as many people as possible have the opportunity to participate in higher education, regardless of their geographic, social, and economic background’. (page 48).

3.74 Furthermore, the Plan sets out detailed plans of how the IMPACT Operation will ensure compliance with each CCT (pages 60 to 73): ‘The IMPACT Operation will integrate all aspects related to the cross-cutting themes into the Operation’s activities. As such, each member of the Operation Delivery Team is responsible for monitoring the delivery of cross-cutting themes in their respective area.’

3.75 It is the expectation that the adherence to CCTs will form part of the external evaluation. Thus, the extent to which these actions have been carried out will be reviewed at the mid-term and subsequent final evaluation.

3.76 The (non-quantitative) Case-Level Cross-Cutting Theme Indicators are as follows:

Equal Opportunities and Gender Mainstreaming:

- Positive action measures—women
- Female participation in STEM
- Activity supporting speakers of the Welsh language.

Sustainable Development:

- BREEAM[19] Excellent where applicable
- Resource efficiency measures
- Use of Sustainable Urban Drainage Systems
- Integration of green and blue infrastructure
- Attainment of CEQUALL[20] for construction activity
- Site environmental management plans

[19] http://www.breeam.com/
[20] http://www.ceequal.com/

- Local supply chain development
- Support for biodiversity activity on a site funded through SFs.

Tackling Poverty and Social Exclusion:

- None.

General:

- Developing/engaging CCT Champions
- Integration of social clauses.

Outputs

3.77 Outputs are what are produced by an intervention's activities.

3.78 At the Inception Evaluation stage, the key questions for the Evaluation Team are: What outputs are produced by the Operation? What are the output targets? What is the timescale to reach them? Are they likely to be achievable?

3.79 The IMPACT Operation's outputs and targets are identified in Table 3.7. They were identified by the Evaluation Team through a desk-based review of the Operation's Business Plan. Below we explain the output (where necessary) and provide stakeholders' views on its achievability.

Table 3.7: Outputs

OUTPUTS What is being produced by IMPACT's activities?		Evaluation Question (Section)	Evaluation Stage	Data Type	Data Source	Indicator	Overall Target (end of June 2023)	Interim Target (Q2 2019)	Monitoring	Data Collection Responsibility
OP 1	**Improved research infrastructure facilities**	How well do these outputs relate to IMPACT's activities and objectives?	All	Quantitative	Operation Documentation & Evaluation Interviews / surveys	Number of improved research infrastructure facilities	1	1	ERDF	IMPACT Team & External Evaluation Team
OP 1a	Research Institute with state-of-the-art reconfigurable specialist laboratories and office space		All	Qualitative	Operation Documentation & Evaluation Interviews / surveys	Number of improved research infrastructure facilities	1	1	ERDF	IMPACT Team & External Evaluation Team
OP 1b	Research equipment (total value £3.5 million) newly available to College of Engineering		All	Quantitative	Operation Documentation & Evaluation Interviews / surveys	Value of research equipment purchased as part of IMPACT	n/a	n/a	ERDF	IMPACT Team & External Evaluation Team
OP 2	Academics newly employed by College of Engineering		All	Quantitative	Operation Documentation & Evaluation Interviews / surveys	Number of new researchers in supported entities	210	Phased	ERDF	IMPACT Team & External Evaluation Team

OUTPUTS What is being produced by IMPACT's activities?		Evaluation Question (Section)	Evaluation Stage	Data Type	Data Source	Indicator	Overall Target (end of June 2023)	Interim Target (Q2 2019)	Monitoring	Data Collection Responsibility
OP 3	Researchers newly employed by College of Engineering		All	Quantitative	Operation Documentation & Evaluation Interviews / surveys	Number of new researchers in supported entities	210	Phased	ERDF	IMPACT Team & External Evaluation Team
OP 4	Collaborations		All	Qualitative & Quantitative	Operation Documentation & Evaluation Interviews / surveys	Number of collaborations with enterprises or research institutions	Enterprises: 50 Research Institutions: 14	n/a	ERDF	IMPACT Team
OP 4a	Initial enquiries about collaboration		All	Quantitative	Operation Documentation & Evaluation Interviews / surveys	Number of enquiries, referrals and other initial contact with potential collaborators	n/a	n/a	Reporting	IMPACT Team
OP 4b	Formal requests for collaboration from organisations and other research institutions		All	Quantitative	Operation Documentation & Evaluation Interviews / surveys	Number of formal requests for collaboration from organisations and other	n/a	n/a	Reporting	IMPACT Team

OUTPUTS What is being produced by IMPACT's activities?		Evaluation Question (Section)	Evaluation Stage	Data Type	Data Source	Indicator	Overall Target (end of June 2023)	Interim Target (Q2 2019)	Monitoring	Data Collection Responsibility
						research institutions				
OP 4c	30 Tata Steel employees co-located at Swansea University by 2019		All	Quantitative	Operation Documentation & Evaluation Interviews / surveys	Number of Tata Steel employees located at College of Engineering	30	30	Reporting	IMPACT Team
OP 5	World-leading cross-disciplinary research in fundamental research fields of Materials Science and Numerical Modelling		All	Qualitative & Quantitative	Operation Documentation & Evaluation Interviews / surveys	n/a	n/a	n/a	Reporting	IMPACT Team & External Evaluation Team
OP 5a	Scientific papers that include a partner as a joint author		All	Quantitative	Operation Documentation & Evaluation Interviews / surveys	Number of scientific papers that include an IMPACT partner as	n/a	n/a	Reporting	IMPACT Team & External Evaluation Team

OUTPUTS What is being produced by IMPACT's activities?		Evaluation Question (Section)	Evaluation Stage	Data Type	Data Source	Indicator	Overall Target (end of June 2023)	Interim Target (Q2 2019)	Monitoring	Data Collection Responsibility
						a joint author				

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3.80 Output 1—improved research infrastructure facilities—includes both the IMPACT Research Institute and its reconfigurable laboratories and office space, but also the research equipment newly available to the College of Engineering.

As of August 2017, the design and build of the IMPACT institute is reported to be on track. The design team are currently at RIBA Stage 4a (Technical Design for Building Regulation Approval), and the construction phase (pre-kitting out of labs) is scheduled for completion in April 2019.

3.81 Output 2—academics newly employed by the CoE—and Output 3—researchers newly employed by the CoE—will be recruited according to a phased approach, as mentioned previously.

3.82 Output 4—collaborations—includes initial enquiries about collaboration, formal request for collaboration from businesses and research institutions, and the co-location of 30 Tata Steel employees to the Metal Technology Centre at IMPACT.

3.83 Output 5—research in fundamental research fields of Materials Sciences and Numerical Modelling—highlights the fact that IMPACT is not solely about the building (the institute). Instead, the building will act as a catalyst for the CoE's existing research in these fields, thereby enabling it to produce more world-leading research (as reflected in the REF 2014 scores). One measure of this research is the REF 2014 score of the College, and another is the number of scientific papers published that includes an IMPACT partner (academic and/or researcher) as one of the authors.

Table 3.8: Progress against ERDF SO1.1 output indicators, August 2017

Indicator	Target	Progress to date (August 2017)
Amount of research funding secured (£)	24,600,000	810,386
Number of improved research infrastructure facilities	1	0
Number of new researchers	210	0.47
Number of researchers working in improved research infrastructure facilities	210	0
Number of collaborations	50	22

3.84 Table 3.8 shows IMPACT's indicators that are reported to WEFO and contribute towards the ERDF WWV Priority 1 Specific Objective 1.1 targets. It also shows the Operation's progress towards its targets, as of August 2017.

Outcomes

3.85 Outcomes are the short and medium-term results of an intervention's activities.

3.86 At the Inception Evaluation stage, the main questions for the Evaluation Team are: what are the short and medium-term results (the outcomes) of IMPACT's activities and outputs? How do they relate to IMPACT's operations? How can we measure them?

3.87 The IMPACT Operation's outcomes are identified in Table 3.9. They were identified by the Evaluation Team through a review of operation documentation, interviews with stakeholders, and a workshop with stakeholders. Below, we explain each identified outcome, and suggest how it might be measured.

Table 3.9: Outcomes

OUTCOMES What are the short and medium-term results from these outputs?		**Evaluation Question (Section)**	**Evaluation Stage**	**Data Type**	**Data Source**	**Indicator**	**Overall Target (by project close)**	**Interim Target (by Q2 2019)**	**Monitoring**	**Data Collection Responsibility**
OC1	Securing of competitive research funding by IMPACT academics and researchers	Are these the best outcomes to determine if IMPACT will achieve its objectives?	Mid-Term & Final	Quantitative	Operation Documentation & Evaluation Interviews / surveys	The amount of research funding secured	£24.6 million	£3,210,333	ERDF	IMPACT Team
OC2	Increased awareness of Swansea University's College of Engineering		Mid-Term & Final	Qualitative	Operation Documentation & Evaluation Interviews / surveys		n/a	n/a	n/a	External Evaluation Team

OUTCOMES What are the short and medium-term results from these outputs?		**Evaluation Question (Section)**	**Evaluation Stage**	**Data Type**	**Data Source**	**Indicator**	**Overall Target (by project close)**	**Interim Target (by Q2 2019)**	**Monitoring**	**Data Collection Responsibility**
OC3	Increased research capacity of College of Engineering		Mid-Term & Final	Qualitative & Quantitative	Operation Documentation & Evaluation Interviews / surveys	Number of researchers working in College of Engineering	n/a	n/a	n/a	External Evaluation Team
OC4	Increased research capability of College of Engineering		Mid-Term & Final	Qualitative	Operation Documentation & Evaluation Interviews / surveys		n/a	n/a	n/a	External Evaluation Team
OC5	Development of new and intensified link between academia and industry		Mid-Term & Final	Qualitative	Operation Documentation & Evaluation Interviews / surveys		n/a	n/a	n/a	External Evaluation Team
OC6	Maximised participation and implementation of Cross Cutting Themes		All	Qualitative	Operation Documentation & Evaluation Interviews / surveys		n/a	n/a	n/a	External Evaluation Team

OUTCOMES What are the short and medium-term results from these outputs?		Evaluation Question (Section)	Evaluation Stage	Data Type	Data Source	Indicator	Overall Target (by project close)	Interim Target (by Q2 2019)	Monitoring	Data Collection Responsibility
OC7	Unintended outcomes		Mid-Term & Final	Qualitative	Operation Documentation & Evaluation Interviews / surveys		n/a	n/a	n/a	External Evaluation Team

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3.88 Outcome 1—securing competitive research funding by IMPACT academics and researchers—has a target of £24.6 million by the end of Operation. We have classified this as an outcome rather than an output, as, although it is perhaps the primary aim of the Operation, and the result indicator for ERDF WWV SO1.1, it is a consequence of more direct outputs (the recruitment of academics and researchers, who will bid for the funding, and the provision of infrastructure, which will enable them to do so). As one of the Operation's ERDF indicators, this data will be recorded by the IMPACT Delivery Team.

3.89 Outcome 2—increased awareness of Swansea University's College of Engineering—refers to the need for research institutions to continually raise their profile in a highly competitive environment. This measure will be qualitatively assessed—we will interview internal and external stakeholders and assess their perception of whether awareness of the CoE has increased.

3.90 Outcome 3—increased research capacity of the CoE—relates to Objective 1 and is one of the core aims of the Operation. It will be assessed quantitatively (using the number of additional academics and researchers employed through IMPACT) and qualitatively (asking stakeholders whether this increase in people has led to a noticeable increase in capacity).

3.91 Outcome 4—increased research capability of the CoE—relates to Objective 1 and is another of the core aims of the Operation. It will largely be assessed qualitatively, so the Evaluation Team will ask stakeholders with a strategic view of the College whether IMPACT has made it able to undertake more varied and more specialised research.

3.92 Outcome 5—development of new and intensified link between academia and industry—relates to Objective 4 and Needs 3 and 4. The Evaluation Team will assess IMPACT's contribution to this outcome by looking at the requests for collaboration received from companies, and the formal collaboration agreements signed by companies. This can be compared to any collaborations already taking place between the CoE and industry. We will also assess whether these collaborations may have occurred anyway, by qualitatively engaging with the businesses.

3.93 Outcome 6—maximising participation and implementation of Cross-Cutting Themes—will be assessed qualitatively through engagement with the members of the IMPACT Delivery Team with responsibility for overseeing the implementation of Cross-Cutting Themes in their area.

3.94 Outcome 7—unexpected outcomes—reflects the fact that, before an intervention, it is rarely possible to predict every outcome (both positive and negative) it might have. As such, it is important that the Evaluation and Delivery Team remain open to the possibility that other outcomes may emerge.

Impacts

3.95 Impacts are the longer-term, less-direct results of an intervention.

3.96 At the Inception Evaluation stage, the main questions for the Evaluation Team are: what are the longer-term results (the outcomes) of IMPACT's activities and outputs, how do they relate to IMPACT's objectives, and how can we measure them?

The IMPACT Operation's impacts are identified in Table 3.10. They were identified by the Evaluation Team through a review of operation documentation, interviews with stakeholders, and a workshop with stakeholders.

Further information about the impacts and detail about our approach to assessing them (the Impact and Counterfactual Assessment) can be found in Chapter 4.

Table 3.10: Impacts

IMPACTS What are the long-term results from these outputs?		**Evaluation Question (Section)**	**Evaluation Question (Number)**	**Evaluation Question**	**Data Type**
IM1	Development of an internationally-competitive regional advanced engineering cluster	Will these impacts address the Operation's objectives	IM1	To what extent has IMPACT activity led to…	Qualitative
IM1a	Attraction, development and retention of international industry to the region		IM1a	To what extent has IMPACT activity led to…	Qualitative

IMPACTS What are the long-term results from these outputs?		Evaluation Question (Section)	Evaluation Question (Number)	Evaluation Question	Data Type
IM1b	Attraction, development and retention of world-class researchers (including Swansea University graduates) and their teams to work in the Swansea Bay City Region		IM1b	To what extent has IMPACT activity led to…	Qualitative
IM2	Driving the economic regeneration agenda (including the Swansea Bay City Region Deal) through developing and extending the scale of industrial R&D in Wales		IM2	To what extent has IMPACT activity led to…	Qualitative
IM3	Increased opportunities for collaboration for other university departments across Wales		IM3	To what extent has IMPACT activity led to…	Quantitative
IM4	Increased success of Welsh research institutions in attracting competitive research funding		IM4	To what extent has IMPACT activity led to…	Qualitative
IM5	Unintended impacts		IM5	To what extent has IMPACT activity led to…	Quantitative

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Notes: For all Impacts the following applies:

Evaluation Stage	Data Source	Group	Data Collection Responsibility
Final	Operation Documentation & Evaluation Interviews / surveys	Long-term Benefits	External Evaluation Team

External factors

3.97 External factors are those factors outside the control of the team delivering an intervention that may influence its outcomes and impacts.

3.98 At the Inception Evaluation stage, the main questions for the Evaluation Team are: what are the external factors that may affect IMPACT's outputs, outcomes and impacts? How may each one affect IMPACT? How is the Operation mitigating them?

The main external factors that may affect IMPACT are presented in Table 3.11. They were identified by the Evaluation Team based on stakeholder interviews and a review of secondary documentation.

Below, we suggest how each factor may affect the Operation, and set out how the Operation can prevent this.

Table 3.11: External factors

EXTERNAL FACTORS What are the external factors that affect these outputs, outcomes and impacts?		**Evaluation Question (Section)**	**Evaluation Question (Number)**	**Evaluation Question**
EF1	Construction market fluctuations	How will IMPACT be affected by external factors?	EF1	How will fluctuations in the construction market affect IMPACT?
EF2	Availability of academics and researchers		EF2	How will the availability of academics and researchers affect IMPACT?
EF3	Industrial economy conditions		EF3	How will industrial economic conditions affect IMPACT?

EXTERNAL FACTORS What are the external factors that affect these outputs, outcomes and impacts?		Evaluation Question (Section)	Evaluation Question (Number)	Evaluation Question
EF4	Research conducted at other institutions		EF4	How will research conducted at other institutions affect IMPACT?
EF5	The UK's exit from the European Union		EF5	How will the UK's exit from the European Union affect IMPACT?
EF6	Changes in policy, particularly UK Industrial Strategy and research funding policies, and responses to the Hazelkorn and Diamond Reviews		EF6	How will changes in policy affect IMPACT?
EF7	Success of the Swansea Bay City Region Economic Regeneration Strategy		EF7	How will the success of the Swansea Bay City Region Economic Regeneration Strategy affect IMPACT?
EF8	Competitiveness / attractiveness of other HEIs / research institutes		EF8	How will competitiveness/attractiveness of other HEIs/research institutes affect IMPACT?
EF9	General economic conditions		EF9	How will general economic conditions affect IMPACT?

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Notes: For all External Factors the following applies:

Evaluation Stage	Data Type	Data Source	Data Collection Responsibility
All	Qualitative	Secondary & Stakeholder Interviews	External Evaluation Team

3.99 External factor 1—construction market fluctuations—may have an effect on the delivery of the physical infrastructure of IMPACT, which in turn may have an effect on the delivery of IMPACT's outputs, outcomes and impacts. Stakeholders identified this as a risk, but expressed confidence that it will be managed and mitigated as much as is possible.

3.100 External factor 2—availability of academics and researchers—refers to the highly-competitive nature of the market for world-leading academics and researchers. Stakeholders were highly aware of this factor, but they were confident that the CoE's recruitment team was effective and that the IMPACT institute and its equipment grants will be attractive to prospective IMPACT partners.

3.101 External factor 3—industrial economy conditions—refers to the risk that an economic downturn may dissuade industry from seeking to innovate and collaborate with research institutions, and act as a barrier to the economic regeneration of the Swansea Bay region.

3.102 External factor 4—research conducted at other institutions—refers to the risk that other research institutions may undertake research in the areas of Materials Science and Numerical Modelling in a non-collaborative manner and therefore outcompete the CoE. The result of this could be difficulties in recruiting world-leading academics and researchers, and therefore difficulty reaching the research funding target.

3.103 External factor 5—the UK's exit from the European Union—is a highly unpredictable factor at this stage of the Operation and the UK's exit negotiations. Stakeholders identified Brexit as a factor, but one that had been taken into account (as much as possible) in the targets agreed with WEFO. Nevertheless, Brexit may have an impact on the availability of academics (although the College currently recruits from around the world) and access to competitive research grants.

3.104 External factor 6—changes in policy, such as UK Industrial Strategy and research funding bodies' strategies—may have an effect on how successful IMPACT is at securing competitive research funding. The Operation is

mitigating this risk by forming a Scientific Steering Group, which will horizon-scan and steer the institute's directions of research.

3.105 External factor 7—success of the Swansea Bay City Region Economic Regeneration Strategy—will affect the extent to which IMPACT and the College of Engineering can attract world-leading talent and industry to the region and contribute to cluster agglomeration.

3.106 External factor 8—competitiveness/attractiveness of other HEIs/research institutes—is closely related to external factor 4.

3.107 External factor 9—general economic conditions—is related to external factor 3, but it is broader, referring to the wider economy, changes in which might affect the availability of competitive research grants.

4. Impact and counterfactual options appraisal

4.1 Being able to measure the additionality of an intervention—that is, the net benefit over and above what would have happened anyway (the deadweight or counterfactual)—is a key aspect of an evaluation.

4.2 Although the application of an in-depth impact and counterfactual assessment will be the focus of the final evaluation stage, it is important to understand early on how it will be carried out so the approach can be validated: For example, to ensure data collected is fit for purpose. Further, it will be necessary to build the measurement process into the Operation data monitoring systems, or external processes at the earliest possible stage.

4.3 Thus, at the Inception Evaluation stage, the Evaluation Team considered the most suitable approaches for the IMPACT Operation and presented them to the Delivery Team. This chapter describes the outcome of the assessment, and is intended to be a point of reference for both the Delivery Team and external evaluators to ensure that monitoring systems are collecting the necessary information to understand the additionality of the IMPACT Operation.

Designing an approach

4.4 Assessing the additionality of any intervention is difficult given the high level of externalities that can also influence the expected outcomes. Of particular concern for the IMPACT Operation is the attribution of impacts, which typically emanate from the output of intervention at the higher levels of the TRL, whilst IMPACT is primarily influencing beneficiaries at the lower levels (1–3). Being able to infer the causality of intervention is a high-concern of this evaluation. The possible approaches applicable to the IMPACT Operation which were considered are:

- **Time-bound** (before and after) and **control** (those benefiting from IMPACT support and those not). Whilst numbers will be relatively small (from a statistical viewpoint), there is scope to develop a basic understanding of whether those businesses experiencing the intervention fared better than might be expected, using industry/Welsh average data for example.

- **Self-assessment** - to simply ask the treatment group (those receiving intervention) the extent to which the intervention they received has resulted in the observed change. Although this 'self-assessment' is a weaker form of evidence (given that it depends on the views of the people receiving treatment), it is widely used as the best available alternative (in the absence of more robust—yet more costly or more complex alternatives).

  The typical self-assessment questions are based around the extent of deadweight (aka counterfactual) and cover three areas to ensure completeness. They are:

- Deadweight 1—the extent to which the beneficiary would have found support elsewhere,
- Deadweight 2—the extent to which the beneficiary would have made the improvements anyway,
- Deadweight 3—the extent to which the observed results are entirely due to the intervention received.

4.5 The most suitable assessment option varied for each of the expected observable impact indicators. As a result, the suggested impact assessment includes a combination of time-bound, control (using industry averages) and self-assessment indicators.

How the Impact of the Operation will be Measured

4.6 The chosen approach to measuring the expected impacts noted in the IMPACT Logic Model (See Chapter 3) are discussed in turn below.

IM1––Development of an internationally-competitive regional advanced engineering cluster

Table 4.1: IM1: Impact indicators and source of evidence

Indicator Ref.	IM1
Target Indicator	Development of an internationally-competitive regional advanced engineering cluster
Metric 1:	Agglomeration Effect: Using the Observatory Star Rating approach for: Size, Specialisation & Focus

Source 1:	• Employment in region: BRES (additionality—control & timebound comparison) • Operation reporting data: OP2, OP3 & OP4c (additionality—timebound) • External evaluation business survey (additionality—self-assessment)
Data Collection Responsibility	External evaluators & Operation Delivery Team Monitoring Data (for Output data noted)
Metric 2:	Competitiveness of cluster - cluster R&D expenditure (private) as a share of sector GDP.
Source 2:	• National Datasets: GERD (additionality—control comparison) • Operation reporting data: OC1 (additionality—timebound) • External evaluation business survey (additionality—self-assessment)
Data Collection Responsibility	External evaluators & Operation Delivery Team Monitoring Data (for Outcome data noted)
Metric 3:	Competitiveness of cluster - Cluster R&D expenditure (public) before and after / compared with other region/cluster (of similar size)
Source 3:	• National Datasets: GERD • Operation reporting data: OC1 • External evaluation business survey (additionality—self-assessment)
Data Collection Responsibility	External evaluators & Operation Delivery Team Monitoring Data (for Outcome data noted)
Metric 4:	Competitiveness of cluster - Businesses: Market share of businesses located in the cluster (change over time). Region turnover as a share of Wales turnover.
Source 4:	• Turnover of businesses from external evaluation business survey (additionality—timebound) • National Datasets for turnover of business using IDBR (additionality—control comparison) • External evaluation business survey (additionality—self-assessment)
Data Collection Responsibility	External Evaluators

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Logic explained

4.7 IMPACT is expected to increase the research capacity and capability of Swansea University's College of Engineering by attracting world-class researchers, improving its infrastructure, and working with industry leading businesses. This increases the attractiveness of the Swansea Bay region to industry working in advanced engineering sectors, and they therefore move to and stay in the region, and an internationally-competitive cluster is developed.

Description of measurement

4.8 **Metric 1:** Agglomeration Effect: Using the Observatory Star Rating approach for: Size, Specialisation & Focus

Using the total number of people employed in sector / region, comparisons will be made with the level of employment in the cluster. The number of people employed in the 'cluster' area will be estimated using both Operation reporting data (OP2, OP3 & OP4c) and information collected via an external evaluation business survey of companies deemed to be working in the advanced engineering sector.

4.9 **Metric 2:** Competitiveness of cluster – cluster R&D expenditure (private) as a share of sector GDP.

Cluster R&D will be measured using data collected by the IMPACT Team (OC1) coupled with R&D expenditure within the cluster from the external evaluation business survey. National datasets will be used to derive comparison R&D expenditure.

4.10 **Metric 3:** Competitiveness of cluster – Cluster R&D expenditure (public) before and after / compared with other region/cluster (of similar size)

Cluster R&D will be measured using data collected by the IMPACT Team (OC1) coupled with R&D expenditure within the cluster from the external evaluation business survey. National datasets will be used to derive comparison R&D expenditure.

4.11 **Metric 4:** Competitiveness of cluster—Businesses: Market share of businesses located in the cluster (change over time). Turnover as a share of national sector GDP.

Using national datasets for a general indication of sectoral turnover nationally (Wales or UK) among businesses within the (SIC) definition, the market share of turnover among businesses within the cluster / region will be calculated.

Adjusting for additionality (deadweight, displacement etc.)

It is likely that for all metrics noted, adjustments will be made for the extent of additionality—which shall be estimated using the external evaluation survey of businesses in the sector - for example, the extent to which new businesses chose to locate in this cluster, over and above other clusters will

be asked (self-assessment), or either control or time-bound comparisons as noted in Table 4.1

Definitions:

4.12 Advanced Engineering Sector: For the purpose of the external evaluation, the advanced engineering sector is defined as including the SIC codes listed in Annex E.

4.13 Cluster: A region can be defined as a cluster if it can be observed as benefiting from economies of agglomeration (firms being located near each other) because of economies of scale (for example, lower costs of production as supply chains locate nearby) and network effects (for example, labour pooling, ease of communication). A way to observe whether cluster agglomeration is present in a region is to use the Observatory Star Rating approach which considers Size (absolute number of people employed in the cluster), Specialisation (proportion of the regional advanced engineering sector that is located in the cluster) and Focus (proportion of employment in the region that are employed in the cluster), and uses the number of people employed, which is publicly available for comparator regions to allow for assessment of progress compared with other areas.

4.14 International Competitiveness: The cluster could be said to have improved its international competitiveness if it is able to attract research funding, people and business to the area, over and above other areas. A measure of this could be the change, over-time (or relative to another area or as a share of the sector at large) of a basket of observable metrics for each element. Suggested metrics for each are detailed in Table 4.1.

4.15 External evaluation business survey: A survey of advanced engineering companies falling within the SIC definition of the sector, within the cluster region will be required, at the final evaluation stage, to provide the evidence noted in Table 4.1.

IM1a––Attraction, development and retention of international industry to the region

Table 4.2: IM1a: Impact indicators and source of evidence

Indicator Ref.	IM1a
Target Indicator	Attraction, development and retention of international industry to the region
Metric / Evidence 1:	Attraction: Net flow (percentage change) of businesses in the sector into the region over time, compared with general sector changes nationally (UK).
Source 1:	Interdepartmental Business Register (IDBR)
Data collection responsibility	External Evaluators
Metric / Evidence 2:	Development: Change in average size (employment & turnover) of businesses in the region.
Source 2:	Business Register and Employment Survey (BRES)
Data Collection Responsibility	External Evaluators
Metric / Evidence 3:	Retention: Comparison of company birth/death rates
Source 3:	ONS Business Demography UK
Data Collection Responsibility	External Evaluators

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Logic explained

4.16 The IMPACT Operation, and specifically the opportunity for industry to collaborate with it, attracts new domestic and international companies to the region. In turn, this industry is developed and supported through the existence of IMPACT, and the companies remain in the region.

Description of measurement

4.17 **Metric 1:** Net flow (percentage change) of businesses in the sector into the region over time, compared with general sector changes nationally (UK).

4.18 The net flow of businesses who operate in the sector within the region will be measured using national datasets as a percentage change. The change over time will be monitored (timebound impact measurement), and compared with general sector changes nationally (UK) (control measurement).

4.19 **Metric 2:** Development: Change in average size (employment & turnover) of businesses in the region.

The change over time (timebound) in the average size of businesses in the region using employment and turnover indicators will be obtained from national datasets.

4.20 **Metric 3:** Retention: Comparison of company birth/death rates.

The net flow of businesses in the cluster over a given period can be compared with average sector birth/death rate as a proxy for the general trend in industry change. ONS Business Demography UK provides data for deaths and survivals of businesses in the UK, by geographical areas and SIC. New registrations for VAT and PAYE (births), cessation of trading (deaths), and duration of trading (survival rates). This will be used for a time-bound comparison of companies operating in the region before and after IMPACT intervention. The external business survey will likely be used to understand the impact of the Operation on company birth rates.

Definitions:

4.21 Attraction: How many businesses in the advanced manufacturing sector come into the region?

4.22 Development: What change occurs in the enterprises in advanced manufacturing sector in the region?

4.23 Retention: How many businesses in the advanced manufacturing sector leave the region?

4.24 Region: For the purpose of this impact assessment, the region will be defined as the local authority (county) of Swansea. Other geographical boundaries will be used throughout the analysis a shown in Table 4.3.

Table 4.3: Evaluation area definitions

Evaluation Area	Geographical Boundary	Code	Description
Cluster	LSOA	W01000917	Neath Port Talbot 010F
		W01000849	Swansea 021A
Region	Local Authority	uacounty14	Swansea
Wider Region	NUTS 3	UKL17	Bridgend and Neath Port Talbot
		UKL22	Cardiff and Vale of Glamorgan
		UKL15	Central Valleys
		UKL16	Gwent Valleys
		UKL21	Monmouthshire and Newport
		UKL18	Swansea

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IM1b––Attraction, development and retention of world-class researchers (including Swansea University graduates) and their teams to work in the Swansea Bay City Region

Table 4.4: IM1b: Impact indicators and source of evidence

Indicator Ref.	IM1b
Target Indicator	Attraction, development and retention of world-class researchers (including Swansea University graduates) and their teams to work in the Swansea Bay City Region
Metric 1:	Net change in researchers due to IMPACT
Source 1:	Operation monitoring data (OP2 and OP3) National Datasets (BRES) Survey of Researchers
Data Collection Responsibility	External Evaluators Operation Monitoring Team
Metric 2:	Proportion of Swansea graduates locating in region
Source 2:	Graduate destination surveys University data such as the Destination of Leavers survey and Operation data recording where new graduates studied.
Data Collection Responsibility	External Evaluators and Operation Delivery Team
Metric 3:	Average Salary of Cluster
Source 3:	Survey of researchers National datasets
Data Collection Responsibility	External Evaluators
Metric 4:	Extent to which researchers are World-class
Source 4:	Hirsch's H-index of researchers

Indicator Ref.	IM1b
Data Collection Responsibility	External Evaluators

Logic explained

4.25 The IMPACT Operation and specifically the infrastructure and existing expertise of the College of Engineering—attracts world-class researchers to work in the Swansea Bay City Region; these researchers are developed by the existence of IMPACT; and they stay in the region.

Description of measurement

4.26 **Metric 1:** Net change in researchers due to IMPACT

We will use the change in absolute researchers (the target output number) compared with general trend in employment numbers in the sector to understand the effect of IMPACT over and above what would already have happened without it. This will enable a control and time-bound analysis. In addition, through a survey of researchers we will understand the extent to which IMPACT affected their decision to locate in the region (self-assessment).

4.27 **Metric 2:** Proportion of Swansea graduates locating in region

Operation monitoring data will need to record the University of study of new researchers (graduates). Data sources available to the Delivery Team will be scoped over the next few months and the most useful data seta agreed with the Evaluation Team. This will be compared with the University's Destination of Leavers surveys to understand general trends in the destination of graduates.

4.28 **Metric 3:** Average Salary of Cluster

The average salary of researchers in the cluster could be seen as an indicator of the attractiveness (and retention) of researchers. Thus, a survey of researchers (or monitoring data) will establish an average salary and this will be compared with average industry salaries (using Standard Occupation Codes) within the sector and region. Finally, the extent to which the salary

on offer impacted on researchers' decisions to locate in the region will be explored through the survey of researchers.

4.29 **Metric 4:** Extent to which researchers are world-class

To understand if the researchers being attracted to IMPACT are 'world-class' as the indicator expects, the Hirch's H-index of researchers could be used and both time-bound and control comparisons (comparison with national averages) could be used.

IM2––Driving the economic regeneration agenda (including the Swansea Bay City Regional Deal) through developing and extending the scale of industrial R&D in Wales

Table 4.5: IM2: Impact indicators and source of evidence

Indicator Ref.	IM2
Target Indicator	Driving the economic regeneration agenda (including the Swansea Bay City Regional Deal) through developing and extending the scale of industrial R&D in Wales
Metric 1	Change in R&D spend by businesses collaborating with IMPACT (As Metric 2 & 3 for IM1)
Source 1	HMRC Data External evaluation business survey (additionality—self-assessment)
Data Collection Responsibility	External Evaluators

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Logic explained

4.30 Companies which collaborate with IMPACT will see an increase in R&D spend; this increase will be greater than the increase across Wales. This increase in R&D spend contributes to the economic regeneration agenda.

Description of measurement

4.31 **Metric 1:** R&D spend by businesses collaborating with IMPACT

The change in R&D spend within businesses which collaborate with IMPACT will be measured (see Metric 2 & 3 of IM1) over time, and compared with the change in R&D spend across Wales/UK and the advanced engineering sector as a whole. Industrial collaborators will also be asked the extent to which they attribute the changes observed to IMPACT (self-assessment).

IM3––Increased opportunities for collaboration for other university departments across Wales

Table 4.6: IM3: Impact indicators and source of evidence

Indicator Ref.	IM3
Target Indicator	Increased opportunities for collaboration for other university departments across Wales
Metric 1	Number of collaborations with HEIs
Source 1	Operation Monitoring Data (OP3) External evaluation business survey (additionality—self-assessment)
Data Collection Responsibility	External Evaluators & Operation Delivery Team

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Logic explained

4.32 IMPACT increases opportunities for collaboration for other university departments across Wales by permitting other departments to collaborate with it (i.e. HEI collaboration). It also increases opportunities for other university departments to collaborate with industry, as it shows that the model of industrial-academia collaboration works.

Description of measurement

4.33 **Metric 1:** Number of collaborations with HEIs

The number of collaborations with HEIs needs to be compared on a time-bound basis, that is, before and after IMPACT. The extent to which the collaboration was the result of IMPACT will need to be asked of collaborating universities.

IM4––Increased success of Welsh research institutions in attracting competitive research funding

Table 4.7: IM4: Impact indicators and source of evidence

Indicator Ref.	IM4
Target Indicator	Increased success of Welsh research institutions in attracting competitive research funding
Metric / Evidence 1:	Change in competitive research funding attracted by Welsh research institutions over time
Source 1:	Swansea University Research Funding Data Survey of HEIs
Data Collection Responsibility	External Evaluators

Logic explained

4.34 Either/both: other Welsh research institution (departments) who collaborate with IMPACT are strengthened by this collaboration, and therefore they attract more competitive funding; IMPACT leads to an increase in the competitive research funding attracted by Swansea University's College of Engineering, whilst Welsh research institutions as a whole attract more competitive research funding.

Description of measurement

4.35 **Metric 1:** Increased success of Welsh research institutions in attracting competitive research funding

Data relating to the amount of competitive funding (for example EPSRC, Horizon 2020, Innovate UK) that Swansea University's College of Engineering has received before and after IMPACT.

IM5––Unintended impacts

4.36 As the Operation is delivered, any unintended impacts will be identified and monitored for reporting at the final evaluation stage.

Baseline position

4.37 The baseline position is intended to be a reference point from which the impact of IMPACT intervention can be measured against in the future. Thus, it primarily relates to the time-bound and control indicators noted above given that self-assessment of impacts can only take place at the point of final assessment (in this case the final evaluation stage), to allow time for the expected impacts to be realised.

4.38 A baseline position for each metric (where possible) is documented below, to allow future comparisons.

IM1—Development of an internationally-competitive regional advanced engineering cluster

4.39 Metric 1: Agglomeration Effect

To assess the agglomeration effect, employment levels will be monitored at each evaluation stage. The most recent BRES data—which is the official source of employee and employment estimates by detailed geography and industry, are the 2016 provisional results. The outputs from this dataset relating to the IMPACT Operation (see sector and region definition in paragraphs 4.13 and 4.24) are shown in Table 5.1.

Size—this relates to the absolute number of people working in the sector. If the size of the regional advanced engineering sector increases overtime—over and above that which is occurring in the industry at large, then it could be argued that IMPACT has had an effect on developing a cluster—by combining this with specialisation and focus (below) and discounting for deadweight and duplication (using the external evaluation business survey). Table 5.1 shows that in 2016, the total number of people employed in the advanced engineering sector in the cluster was 1,455. The extent to which this figure changes overtime, and in relation to general trends in the change in employment in the sector will be measured at latter evaluation stages to compare change.

Table 5.1: Employees and employment in advanced engineering and whole economy

	Advanced Engineering						Whole Economy
	Employees				Employment		Employment
	Full-time		Part-time				
Evaluation Area	Number	Industry Percent	Number	Industry Percent	Number	Industry Percent	Number
Cluster	1,320	35	125	10	1,455	27	5,250
Region	14,500	22	1,375	3	16,500	15	110,500
Wider Region	146,500	30	11,625	5	162,500	22	792,000
Wales	235,500	29	18,000	4	261,500	20	1,332,500
GB	5,013,000	25	621,000	7	5,769,000	19	30,305,000

ONS: BRES 2016, data accessed via Nomis on 06 October 2017, tables prepared by Miller Research (UK) Ltd.

Specialisation—This is a measure of the share of industry employment that takes place in the area under observation. In this case, we are concerned with how much the employment in the cluster (or region) accounts for all advanced engineering in the region (or the wider region). Subsequent evaluations will measure the change in this ratio. Using Table

5.1, it can be observed that at present (2016 data), employment in the advanced engineering sector in the cluster accounts for 8.8 per cent of employment in advanced engineering in the region (1,455 / 16,500). If this percentage increases as a result of IMPACT then it could be suggested that the Operation has increased the 'specialisation' of the area, which could lead to (or be the result of) an agglomeration effect. In doing so, the ambition to develop an internationally-competitive cluster could have said to have been achieved (subject to the necessary adjustments). Thus, for the purpose of the evaluation, this figure will be monitored to evidence change.

Focus—The share of employment in the advanced engineering sector as a proportion of all employment in the area. That is, how 'focussed' the area is on the sector's employment. Table 5.1 shows that employment in the advanced engineering sector in the cluster (1,455) accounts for 27 per cent of all industry employment in the area (5,250).[21] If this percentage increases then the area's focus on the advanced engineering sector increases, which also increases the area's attractiveness as a place to locate (the agglomeration effect). Of note, the focus of the cluster, as a share of all employment in the area's is greater than all other areas shown in Table 5.1, which relatively speaking, suggests a higher level of focus in the cluster area on advanced engineering.

4.40 Metric 2: Competitiveness of Cluster: R&D Expenditure (private)

National datasets will be used as a control to understand general changes against which observed changes among the treatment group (those engaging with IMPACT) can be compared. The most recent data available is the UK gross domestic expenditure on research and development regional dataset (GERD)[22] for 2015 (released March 2017). Data is not available by sector,[23] therefore general trends in the change in R&D for

[21] BRES rounds percentages down. Hence the figure 27.71 resulting from the calculations shown in the table, are rounded down to 27%.
[22] The UK gross domestic expenditure on research and development (GERD) provides information on total R&D expenditure in the UK. R&D is defined as "Creative and systematic work undertaken in order to increase the stock of knowledge - including knowledge of humankind, culture and society - and to devise new applications of available knowledge". Estimates are published annually. Data is not available by sector.
[23] ONS refer to the 'sector' performing the R&D as noted in Table 5.2 whereas 'sector' in this context is meant to refer to the breakdown of industry for advanced manufacturing defined in this report.

Wales (region) will be used as a control. For the purpose of the evaluation, 'private' R&D expenditure will comprise the category 'business' only. Table 5.2 shows the current level of private sector R&D expenditure in Wales as £362 million (a 29 per cent reduction since 2014—private R&D expenditure in Wales in 2014 was £513 million).

4.41 Metric 3: Competitiveness of Cluster: R&D Expenditure (public)

As noted for Metric 2, the GERD will be used to inform Metric 3. Public R&D expenditure will refer to the Government and Higher Education categories. Table 5.2 shows the amount of R&D expenditure in 2015 by Government (£13 million) and Higher Education (£286 million).

Table 5.2: R&D expenditure by region, 2015

	Sector performing the R&D		
			£millions
	Government	**Higher Education**	**Business**
Wales	13	286	362
United Kingdom	2,097	8,009	20,885

ONS: GERD 2015, data accessed on 06 October 2017, tables prepared by Miller Research (UK) Ltd.

4.42 Metric 4: Competitiveness of Cluster: Businesses—Market Share

Market share will be measured as the proportion of sector turnover within one area as a share of sector turnover in another area. National datasets will be used as a control. The Inter-Departmental Business Register (IDBR)[24] provides banded turnover estimates, broken-down by five-digit SIC, for a range of geographical boundaries (the lowest is local authority level). This allows an estimate of the turnover of companies in the advanced engineering sector within Swansea local authority (county) to be obtained. This can be compared with larger geographical areas to understand how market share has changed, relative to general changes. Table 5.3 shows that at present (2017 data) the advanced engineering sector in Swansea (local authority) accounted for a share of 9.5 per cent of the advanced engineering turnover generated in the wider region (South Wales) and 5.9 per cent of the sector in the whole of Wales.

[24] The Inter-Departmental Business Register (IDBR) is a comprehensive list of UK businesses used by government for statistical purposes.

Table 5.3: Turnover in advanced engineering, 2017

	Turnover[1]	Region turnover as share of other areas
	£millions	%
Region	1,356	n/a
Wider Region	14,232	9.5%
Wales	23,087	5.9%
GB	622,671	0.22%

ONS: IDBR 2017, data accessed via Nomis on 09 October 2017, tables prepared by Miller Research (UK) Ltd.

Notes: Turnover shown is a mid-point estimate of grouped data provided by the IDBR.

IM1a—Attraction, development and retention of international industry to the region

4.43 Metric 1 Attraction: Net flow of businesses in the sector

The net flow of businesses into the sector as a percentage change will be used to inform the extent to which businesses have been attracted to the region. The IDBR will be used as a control to measure general trends. Table 5.4 shows the available data for the geographical areas of study. The number of businesses increased in the Swansea region (local authority) by 3.4 per cent between 2016 and 2017, the same as the average sector growth rate in Wales, but less than the sector average across the UK (4 per cent) and the wider region (south east Wales—4.8 per cent).

Table 5.4: Change in number of enterprises and turnover in advanced engineering, 2016–2017

			Region	Wider Region	Wales	UK
Enterprises	**Number**	**2016**	1,595	13,340	24,330	692,215
		2017	1,650	13,975	25,155	719,795
		Change	3.4%	4.8%	3.4%	4.0%
Turnover	**£**	**2016**	821,473	1,037,683	920,207	899,504
		2017	821,667	1,031,310	917,785	890,177
		Change	0.02%	-0.61%	-0.26%	-1.04%

ONS: IDBR 2017, data accessed via Nomis on 10/10/2017, tables prepared by Miller Research (UK) Ltd.

Notes: Turnover shown is a mid-point estimate of grouped data provided by the IDBR.

4.44 Metric 2 Development: Change in Average size of businesses

The change in the average size of businesses of those engaging with IMPACT will be monitored and compared with general industry trends using employment numbers and turnover. Table 5.4 shows the change in turnover in the advanced engineering sector between 2016 and 2017, for the study areas. It shows that in the region (Swansea local authority—the smallest geographical boundary for which data is available at the necessary SIC breakdown) turnover increased marginally by 0.2 per cent, compared with a decrease in turnover in the advanced engineering sector across the wider region (south east Wales), Wales and the rest of the UK.

Table 5.5 shows the change in employment in the Advanced Engineering sector within the evaluation areas. Within the cluster area, employment increased by 17 per cent (210 additional people in employment), which was notably higher than the average change in employment across the other evaluation areas.

Table 5.5: Change in employment in advanced engineering, by evaluation area, 2016–2017

	2015	2016	
Evaluation Area		**Number**	**Change**
Cluster	1,245	1,455	17%
Region	16,500	16,500	0%
Wider Region	159,000	162,500	2%
Wales	263,000	261,500	-1%
GB	5,662,500	5,769,000	2%

ONS: BRES 2015 - 2016, data accessed via Nomis on 10/10/2017, tables prepared by Miller Research (UK) Ltd.

Metric 3 Retention: Comparison of business birth/death rates

4.45 The level of industry retention will be measured by a net business birth / death rate in the cluster area, compared with national trends. The ONS Business Demography UK data provides business birth / death rates. The net birth/death rate as a proportion of activity businesses within the UK advanced engineering sector was 6.6 per cent in 2015 (Table 5.6).

Table 5.6: Business birth, death and active numbers for the UK advanced engineering sector, 2015

	Births	Deaths	Active	Net births/deaths	Net births/deaths / active businesses
Engineering Sector - UK[25]	108,510	61,040	721,820	47,470	6.6%

ONS: Business Demography 2015, data accessed on 10 October 2017, tables prepared by Miller Research (UK) Ltd.

IM1b—Attraction, development and retention of world-class researchers (including Swansea University graduates) and their teams to work in the Swansea Bay City Region

4.46 Metric 1: Net Change in Researchers due to IMPACT

The net change in the number of researchers (OP2 & OP3) will be compared with the general employment trend change in the sector (see IM1 Metric 1, Table 5.1).

4.47 Metric 2: Proportion of Graduates locating in the region

The place of study of new graduates will be recorded and compared with other Swansea University graduate data such as the Destination of Leavers survey data (not available at the inception stage).

4.48 Metric 3: Average Salary of Cluster

The average salary of the advanced engineering cluster will be collected through a survey of researchers. This could be compared with general industry trends. The Annual Survey of Hours and Earnings (ASHE) provides information about pay for the whole economy by a range of geographical areas—the lowest being local authority. Alternatively, it provides data for four digit SIC code, but for the whole of the UK. The mean annual gross pay for the Swansea Local Authority, as of October 2017 was £23,819 (Table 5.7). Meanwhile, the average (mean) of the advanced engineering sector (using four digit SIC) across the UK as a whole is £27,378.32.[26]

[25] Based on three-digit SIC codes. See Annex for SIC definition.
[26] Calculated using Table 16.7a of the ASHE, 2016. Average of mean annual pay (gross) (£).

Table 5.7: Average (mean) annual pay by area, 2017

Area	Annual pay - gross
	£
Swansea (Local Authority)	23,819
UK	28,213
Wales	25,400

4.49 Metric 4: Extent to which researchers are World-class

The h-index is an author level metric that attempts to measure both the productivity and citation impact of the publications of a scientist or scholar.[27] It takes into consideration both the number of papers and the citations to enable comparisons between authors. For the purpose of this evaluation, it is suggested that the h-index of new IMPACT researchers is monitored as papers are published. A score of over 60 is considered high. As such, there is no baseline (although a search of current researchers in the School of Engineering to derive a h-index could be considered). The h-index for an individual can be established at any given time -using a search of publications within a given time-period.

To complement the h-index, a qualitative assessment of the extent to which the new researchers are deemed 'world-class' by their peers should also be considered.

IM2—Driving the economic regeneration agenda (including the Swansea Bay City Regional Deal) through developing and extending the scale of industrial R&D in Wales

4.50 Metric 1—Change in R&D spend by businesses

Please see IM1 Metric 2 & 3 (paragraphs 4.9 and 4.10) for baseline comparison.

IM3—Increased opportunities for collaboration for other university departments across Wales

4.51 Metric 1—Number of collaborations with HEIs

[27] https://en.wikipedia.org/wiki/H-index

There is no comparison baseline. The counterfactual will be assessed through self-assessment of the extent to which IMPACT influenced collaborations via the external evaluation business survey.

IM4—Increased success of Welsh research institutions in attracting competitive research funding

4.52 The change in research funding among Welsh HEIs can be measured using GERD data. See Table 5.2 and paragraph 5.5.

IM5—Unintended impacts

4.53 Unintended impacts will be considered as the Operation delivery progresses.

Cross-Cutting Themes

4.54 A baseline position for the current situation regarding the chosen cross-cutting theme indicators (when they are determined) should be established. Thus, at present there is no baseline position.

5. Conclusions and next steps

Policy drivers

5.1 Overall, the scoping and mapping work undertaken by the IMPACT Delivery Team, and the clear impact this had had on the Operation's design, suggests that IMPACT has excellent strategic fit at this stage in its delivery. This view was also reflected by stakeholders both internal and external to the Operation. The horizon-scanning activities of a Scientific Steering Group and Senior Scientific Advisor also give confidence that this alignment will remain as delivery progresses, even if the strategic priorities of certain bodies (for example, EPSRC) shift, or funding sources (for example, Horizon 2020) become inaccessible.

Needs

5.2 Overall, it is clear that there is a need for research institutions in Wales (and particularly in West Wales and the Valleys) to increase their capacity and capability in research areas in which they are already high-achieving, in order to increase their success in securing competitive research funding. It is also important that this increase in success benefits the wider region within which the institute resides, particularly industry and businesses, and therefore close and mutually-beneficial relationships between industry and academia must be encouraged. The IMPACT Operation, with its focus on increasing the capacity and capability of the College of Engineering in research areas in which it is world-leading, with the overall aim to secure greater amounts of competitive funding and increasing competitiveness, therefore directly addresses these needs (which themselves derive from the policy identified in the previous section). Stakeholders unanimously agreed that there is a need for IMPACT, and there was widespread confidence that the design of the Operation is well-suited to addressing this need.

Objectives

5.3 Stakeholders were generally confident that the objectives for the IMPACT Operationas identified in the Business Plan—were valid (in terms of addressing the needs for the Operation) and achievable, should the activity proposed in the Business Plan be undertaken as stated.

5.4 At the Mid-Term and Final Evaluation stages, the Evaluation Team will assess the extent to which the Operation is achieving its objectives, using both qualitative assessment from stakeholders and quantitative measures of progress against targets.

Inputs

5.5 Overall, it seems that the IMPACT Operation has sufficient resources to achieve its objectives (assuming external factors are mitigated for effectively). Comprehensive governance and management systems have been put in place, and the personnel involved are experienced in operational delivery and give confidence to stakeholders that the Operation will be delivered successfully. The Operation's Business Plan is comprehensive, and shows evidence of extensive engagement with other operations/bodies/groups, in order that the Operation can have the greatest possible impact.

5.6 At the Mid-term and Final Evaluation stages, the Evaluation Team will review progress to date and re-assess whether the inputs/resources available to the Operation are sufficient.

Activity

5.7 Overall, it seems that IMPACT has the processes in place in order to achieve its objectives. Stakeholders also seemed satisfied that this is the case.

5.8 At the Mid-term Evaluation stage, the Evaluation Team will appraise the extent to which the Operation is carrying out its activities as planned, and make recommendations for improvement to delivery, if required. This appraisal will be based on a review of monitoring data and various consultation activities with stakeholders (including the Operational Delivery Board).

Outputs

5.9 At this early stage of the Operation, stakeholders were generally confident that IMPACT will achieve its output targets, due to the thorough planning that underpins the Operation and the status given to it within the College.

5.10 At the Mid-Term and Final Evaluation stages, the Evaluation Team will quantitatively assess the outputs of the Operation to date using operational monitoring data. The research produced by IMPACT will be assessed quantitatively—the number of research papers with a partner as joint author—and qualitatively—asking stakeholders their perceptions of the research.

Outcomes

5.11 Overall, the anticipated outcomes suggest that IMPACT will achieve its objectives, principally increasing the capacity and capability of the CoE so that it can secure £24.6 million of competitive research funding by 2022/23.

5.12 At the Mid-Term Evaluation stage, the main evaluation questions will be: What is the current achieved value? Will the target be achieved? Should the target be revised? The Evaluation Team will answer these questions using the monitoring data collected by the Delivery Team, an online survey of beneficiaries, and qualitative engagement with internal and external stakeholders.

Impacts

5.13 The IMPACT Operation is operating in an uncertain economic climate due to the ongoing Brexit negotiations, the outcome of which will have profound consequences for the higher education and research sectors in Wales and the UK. However, IMPACT has been designed in this context, and stakeholders seemed confident that thorough planning and flexible delivery (regular horizon-scanning of future funding opportunities and growth areas, especially those that do not require membership of the European Union) will allow the Operation to achieve its objectives.

5.14 At the Mid-Term and Final Evaluation stages, the Evaluation Team will continue to review the external factors affecting IMPACT, and recommend as to whether the Operation could do more to mitigate them.

Impact and counterfactual

5.15 This report provides a detailed approach to measuring the impact and counterfactual and clearly sets out the data that will be required to inform

assessment. The main challenge of the assessment will be understanding the additionality of IMPACT intervention—especially considering that intervention is at the lower levels (1–3) of the TRL index. To provide as comprehensive assessment as is possible within the constraints of the evaluation scope, a combination of control, time-bound and self-assessment metrics have been suggested. The report then offers a baseline position for each indicator where relevant. The coverage and quality of data collection should be monitored on an on-going basis during IMPACT delivery to ensure that the necessary data is in place. This will formally be reviewed by the external evaluators at the mid-term evaluation.

Mid-term Evaluation

5.16 The mid-term evaluation will follow approximately 12 months after the publication of the inception evaluation report. At that time, the external evaluators will gather the data collected as set out in this report to carry out an independent review of progress. The purpose of the mid-term evaluation will be to assess progress to date, to check that the Operation is on-target to meet its objectives and to identify any lessons learnt or ways in which the Operation could be re-shaped if necessary to maximise its impact for the duration of the Operation's delivery.

6. Recommendations

6.1 Based on the findings in the report the following recommendations pertinent to the external evaluation are suggested:

- IMPACT Operation Team and the external evaluation team to monitor data collection systems to ensure data coverage as set out in the evaluation framework in this report. Specifically, the monitoring data should ensure that Operation data records where new graduates studied (in reference to Metric 2 of IM1b see Table 4.4).

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Annex A––Stakeholder Interview List

Organisation	Name	Role
Swansea University	Prof Johann Sienz	Operation Director
Swansea University	Dr Gavin Bunting	Operation Deputy Director
Swansea University	Prof Steve Brown	Head of College of Engineering
WEFO	Jackie Jones	Project Development Officer
WEFO	Keith Parsons	Project Development Manager
Welsh Government	Alastair Davies	Head of Innovation Policy
Swansea University	Prof Steve Wilks	Pro-Vice Chancellor Major Projects
Swansea University	Owen Rees	Estates Department
Swansea University	Dr Miles Willis	Head of Infrastructure and Development
Swansea University	John Roberts	IMPACT Senior Scientific Advisor

Annex B––Stakeholder Interviews Topic Guide

- [If not known] What is your involvement with the IMPACT Operation?

Strategic/Policy Fit:

- In your opinion, what are the key policies driving the rationale for the IMPACT Operation?

[prompt: ERDF WWV SO1.1, EPF, Smart Specialisation Strategy, Innovation Wales and Science Wales, Swansea Bay City Region etc.]

Needs:

- What is/are the need/s for IMPACT?
    - ERDF WWV SO 1.1
    - Priority 1, Specific Operation 1.1
    - 'To increase the success of Welsh research institutions in attracting competitive and private research funding'
    - Smart Specialisation Strategy

[prompt: needs from Evaluation Framework]

Objectives:

- What change/changes is IMPACT trying to achieve? [INTRODUCE THIS TOPIC BROADLY AT FIRST THEN NARROW IN ON SPECIFIC AIM / OBJECTIVES below]
- Aims
    - 'To develop a specialised, multidisciplinary, fully-staffed and equipped Research Institute that will increase capacity and capability of the College of Engineering at Swansea University
    - To undertake world-leading research in Materials, Processing and Numerical Technologies research groups
    - Directly aligned with Welsh Government Grand Challenge area of Advanced Engineering and Materials' (Business Plan)
- Six objectives:

[Note: ask for their understanding of the objectives more generally first. Then discuss each if necessary or if their understanding does not cover all]

- What are your expectations of the achievement of the objectives? Are any more difficult to achieve? Why?

[prompt: Objectives from Evaluation Framework…to stimulate discussion only]

Activities:

- Are IMPACT's five delivery themes the most effective way to deliver the Operation, in order to reach its targets?
- What are the management and governance arrangements for the Operation?
- Please could you explain the delivery structure / processes that will be followed for IMPACT—to get from the Inputs, to Outputs?
- How is / will achievement being monitored?
- Do you anticipate there will be synergies between IMPACT and other European-funded operations at Swansea University?
    - ERDF
    - SPECIFIC2
    - SPARC II
    - ASTUTE 2020
    - Computational Foundry
    - ESF
    - M2A
    - KESS II
    - METaL 2
    - (FdEng-BEng)

Outputs:

- How were the targets identified / set?

- Are IMPACT's targets achievable?
    - Recruitment of academic staff (65)
    - Researchers (155)
    - £24.6 million research funding attracted
    - Requires an average increase in funding secured per staff member in CoE from £133,000 to £220,000/year
    - Is this achievable?
    - Do you foresee any issues / barriers / concerns which might prevent the achievement of targets?

Outcomes:

- In your opinion, what will be the short and medium-term results of IMPACT?
- How will outcomes be measured / should be measured?

Impacts:

- In your opinion, what will be the long-term impact of IMPACT?
- How will we know if IMPACT has been a success in the long-run? What are the key identifiers?
- How will impacts be measured / should be measured?
- What is the expected legacy for IMPACT post ERDF funding?

External factors:

- In your opinion, what are the main external factors that will affect the IMPACT Operation?
- What are the implications of Brexit on the Operation?

PROMPT [below]

- General economic / political environment
- Technological change
- Behavioural (demand) changes

Cross Cutting Themes

- What is IMPACT doing to address CCTs?
- How effectively will IMPACT will meet CCT targets?

Resources:

- As far as you are aware, does/will the IMPACT Operation have the right resources available to it? These include:
    - People
    - Swansea University
    - IMPACT Delivery Team
    - Funding
    - £35 million over 8 years
    - Support from external stakeholders (for example, Welsh Government, Innovate UK)
    - Governance and Management structures [Note: stakeholders may not be aware of this so explain the governance & structures if necessary, as below]

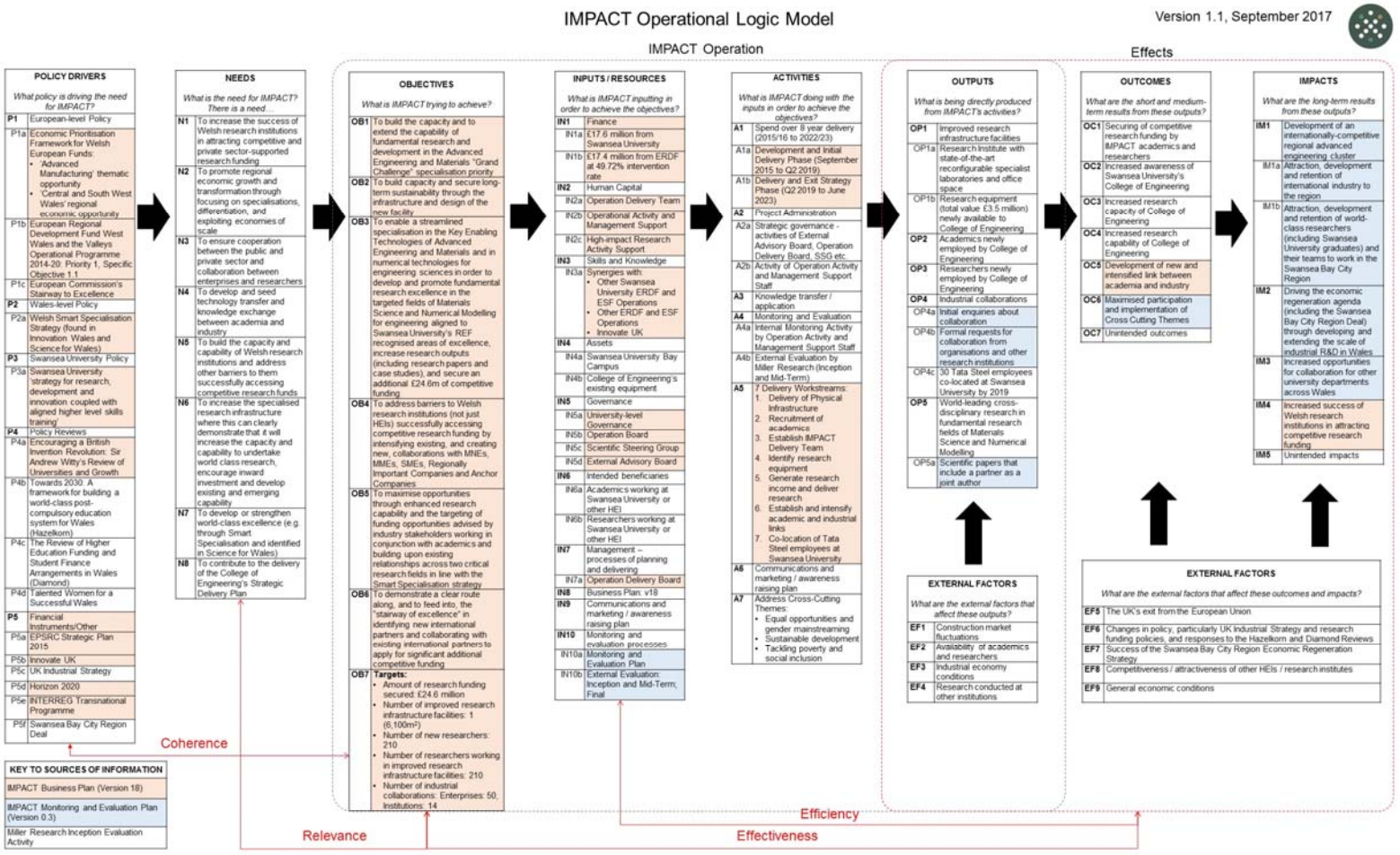
About the Evaluation

- What are your expectations of the inception evaluation of IMPACT?
- And the mid-term? And eventually final?
- Is there anything else you think we should be aware of as external evaluators, at this stage in the Operation?

Annex C––Stakeholder Logic Model Workshop Attendee List

Organisation	Name	Role
Welsh Government	Alastair Davies	Head of Innovation Policy
Swansea University	Dr Anke Heuberger	IMPACT Operation Manager
Swansea University	Dr Gavin Bunting	Operation Deputy Director
Swansea University	Dr Miles Willis	Head of Infrastructure and Development
WEFO	Keri Nicholls	Research, Monitoring and Evaluation
WEFO	Keith Parsons	Project Development Manager
Swansea University	Nicola Davies	IMPACT Legal and Contracts Coordinator
Swansea University	Owen Rees	Estates Department
Swansea University	Prof David Worsley	College of Engineering Director of Research
Swansea University	Prof Johann Sienz	IMPACT Operation Director
Swansea University	Prof Steve Brown	Head of College of Engineering, IMPACT Senior Responsible Officer
Swansea University	Prof Steve Wilks	Pro-Vice Chancellor Major Projects

Annex D––Operational Logic Model



High-quality version available here (link to webpage)

Annex E––Advanced Engineering Sector Definition by Standard Industrial Classification (SIC) Codes

5 Digit SIC	5 Digit Description
05101	Deep coal mines
05102	Open cast coal working
05200	Mining of lignite
06100	Extraction of crude petroleum
06200	Extraction of natural gas
07100	Mining of iron ores
07210	Mining of uranium and thorium ores
07290	Mining of other non-ferrous metal ores
08110	Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate
08120	Operation of gravel and sand pits; mining of clays and kaolin
08910	Mining of chemical and fertilizer minerals
08930	Extraction of salt
08990	Other mining and quarrying n.e.c.
09100	Support activities for petroleum and natural gas extraction
09900	Support activities for other mining and quarrying
10130	Production of meat and poultry meat products
10200	Processing and preserving of fish, crustaceans and molluscs
10310	Processing and preserving of potatoes
10320	Manufacture of fruit and vegetable juice
10390	Other processing and preserving of fruit and vegetables
10410	Manufacture of oils and fats
10420	Manufacture of margarine and similar edible fats
10511	Liquid milk and cream production
10512	Butter and cheese production
10519	Manufacture of other milk products
10520	Manufacture of ice cream
10611	Grain milling

10612	Manufacture of breakfast cereals and cereals-based food
10620	Manufacture of starches and starch products
10710	Manufacture of bread; manufacture of fresh pastry goods and cakes
10720	Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes
10730	Manufacture of macaroni, noodles, couscous and similar farinaceous products
10810	Manufacture of sugar
10821	Manufacture of cocoa and chocolate confectionery
10822	Manufacture of sugar confectionery
10831	Tea processing
10832	Production of coffee and coffee substitutes
10840	Manufacture of condiments and seasonings
10850	Manufacture of prepared meals and dishes
10860	Manufacture of homogenized food preparations and dietetic food
10890	Manufacture of other food products n.e.c.
10910	Manufacture of prepared feeds for farm animals
10920	Manufacture of prepared pet foods
11010	Distilling, rectifying and blending of spirits
11020	Manufacture of wine from grape
11030	Manufacture of cider and other fruit wines
11040	Manufacture of other non-distilled fermented beverages
11050	Manufacture of beer
11060	Manufacture of malt
11070	Manufacture of soft drinks; production of mineral waters and other bottled waters
12000	Manufacture of tobacco products
13100	Preparation and spinning of textile fibres
13200	Weaving of textiles
13300	Finishing of textiles
13910	Manufacture of knitted and crocheted fabrics
13921	Manufacture of soft furnishings
13922	manufacture of canvas goods, sacks, etc.

13923	manufacture of household textiles
13931	Manufacture of woven or tufted carpets and rugs
13939	Manufacture of other carpets and rugs
13940	Manufacture of cordage, rope, twine and netting
13950	Manufacture of non-wovens and articles made from non-wovens, except apparel
13960	Manufacture of other technical and industrial textiles
13990	Manufacture of other textiles n.e.c.
14110	Manufacture of leather clothes
14120	Manufacture of workwear
14131	Manufacture of other men's outerwear
14132	Manufacture of other women's outerwear
14141	Manufacture of men's underwear
14142	Manufacture of women's underwear
14190	Manufacture of other wearing apparel and accessories n.e.c.
14200	Manufacture of articles of fur
14310	Manufacture of knitted and crocheted hosiery
14390	Manufacture of other knitted and crocheted apparel
15110	Tanning and dressing of leather; dressing and dyeing of fur
15120	Manufacture of luggage, handbags and the like, saddlery and harness
15200	Manufacture of footwear
16100	Sawmilling and planing of wood
16210	Manufacture of veneer sheets and wood-based panels
16220	Manufacture of assembled parquet floors
16230	Manufacture of other builders' carpentry and joinery
16240	Manufacture of wooden containers
16290	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials
17110	Manufacture of pulp
17120	Manufacture of paper and paperboard
17211	Manufacture of corrugated paper and paperboard, sacks and bags
17219	Manufacture of other paper and paperboard containers

17220	Manufacture of household and sanitary goods and of toilet requisites
17230	Manufacture of paper stationery
17240	Manufacture of wallpaper
17290	Manufacture of other articles of paper and paperboard n.e.c.
18110	Printing of newspapers
18121	Manufacture of printed labels
18129	Printing n.e.c.
18130	Pre-press and pre-media services
18140	Binding and related services
18201	Reproduction of sound recording
18202	Reproduction of video recording
18203	Reproduction of computer media
19100	Manufacture of coke oven products
19201	Mineral oil refining
19209	Other treatment of petroleum products (excluding petrochemicals manufacture)
20110	Manufacture of industrial gases
20120	Manufacture of dyes and pigments
20130	Manufacture of other inorganic basic chemicals
20140	Manufacture of other organic basic chemicals
20150	Manufacture of fertilizers and nitrogen compounds
20160	Manufacture of plastics in primary forms
20170	Manufacture of synthetic rubber in primary forms
20200	Manufacture of pesticides and other agrochemical products
20301	Manufacture of paints, varnishes and similar coatings, mastics and sealants
20302	Manufacture of printing ink
20411	Manufacture of soap and detergents
20412	Manufacture of cleaning and polishing preparations
20420	Manufacture of perfumes and toilet preparations
20510	Manufacture of explosives
20520	Manufacture of glues

20530	Manufacture of essential oils
20590	Manufacture of other chemical products n.e.c.
20600	Manufacture of man-made fibres
21100	Manufacture of basic pharmaceutical products
21200	Manufacture of pharmaceutical preparations
22110	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres
22190	Manufacture of other rubber products
22210	Manufacture of plastic plates, sheets, tubes and profiles
22220	Manufacture of plastic packing goods
22230	Manufacture of builders ware of plastic
22290	Manufacture of other plastic products
23110	Manufacture of flat glass
23120	Shaping and processing of flat glass
23130	Manufacture of hollow glass
23140	Manufacture of glass fibres
23190	Manufacture and processing of other glass, including technical glassware
23200	Manufacture of refractory products
23310	Manufacture of ceramic tiles and flags
23320	Manufacture of bricks, tiles and construction products, in baked clay
23410	Manufacture of ceramic household and ornamental articles
23420	Manufacture of ceramic sanitary fixtures
23430	Manufacture of ceramic insulators and insulating fittings
23440	Manufacture of other technical ceramic products
23490	Manufacture of other ceramic products n.e.c.
23510	Manufacture of cement
23520	Manufacture of lime and plaster
23610	Manufacture of concrete products for construction purposes
23620	Manufacture of plaster products for construction purposes
23630	Manufacture of ready-mixed concrete
23640	Manufacture of mortars

23650	Manufacture of fibre cement
23690	Manufacture of other articles of concrete, plaster and cement
23700	Cutting, shaping and finishing of stone
23910	Production of abrasive products
23990	Manufacture of other non-metallic mineral products n.e.c.
24100	Manufacture of basic iron and steel and of ferro-alloys
24200	Manufacture of tubes, pipes, hollow profiles and related fittings, of steel
24310	Cold drawing of bars
24320	Cold rolling of narrow strip
24330	Cold forming or folding
24340	Cold drawing of wire
24410	Precious metals production
24420	Aluminium production
24430	Lead, zinc and tin production
24440	Copper production
24450	Other non-ferrous metal production
24460	Processing of nuclear fuel
24510	Casting of iron
24520	Casting of steel
24530	Casting of light metals
24540	Casting of other non-ferrous metals
25110	Manufacture of metal structures and parts of structures
25120	Manufacture of doors and windows of metal
25210	Manufacture of central heating radiators and boilers
25290	Manufacture of other tanks, reservoirs and containers of metal
25300	Manufacture of steam generators, except central heating hot water boilers
25400	Manufacture of weapons and ammunition
25500	Forging, pressing, stamping and roll-forming of metal; powder metallurgy
25610	Treatment and coating of metals
25620	Machining

25710	Manufacture of cutlery
25720	Manufacture of locks and hinges
25730	Manufacture of tools
25910	Manufacture of steel drums and similar containers
25920	Manufacture of light metal packaging
25930	Manufacture of wire products, chain and springs
25940	Manufacture of fasteners and screw machine products
25990	Manufacture of other fabricated metal products n.e.c.
26110	Manufacture of electronic components
26120	Manufacture of loaded electronic boards
26200	Manufacture of computers and peripheral equipment
26301	Manufacture of telegraph and telephone apparatus and equipment
26309	Manufacture of communication equipment other than telegraph, and telephone apparatus and equipment
26400	Manufacture of consumer electronics
26511	Manufacture of electronic measuring, testing etc. equipment, not for industrial process control
26512	Manufacture of electronic industrial process control equipment
26513	Manufacture of non-electronic measuring, testing etc. equipment, not for industrial process control
26514	Manufacture of non-electronic industrial process control equipment
26520	Manufacture of watches and clocks
26600	Manufacture of irradiation, electromedical and electrotherapeutic equipment
26701	Manufacture of optical precision instruments
26702	Manufacture of photographic and cinematographic equipment
26800	Manufacture of magnetic and optical media
27110	Manufacture of electric motors, generators and transformers
27120	Manufacture of electricity distribution and control apparatus
27200	Manufacture of batteries and accumulators
27310	Manufacture of fibre optic cables
27320	Manufacture of other electronic and electric wires and cables
27330	Manufacture of wiring devices
27400	Manufacture of electric lighting equipment

27510	Manufacture of electric domestic appliances
27520	Manufacture of non-electric domestic appliances
27900	Manufacture of other electrical equipment
28110	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines
28120	Manufacture of fluid power equipment
28131	Manufacture of pumps
28132	Manufacture of compressors
28140	Manufacture of taps and valves
28150	Manufacture of bearings, gears, gearing and driving elements
28210	Manufacture of ovens, furnaces and furnace burners
28220	Manufacture of lifting and handling equipment
28230	Manufacture of office machinery and equipment (except computers and peripheral equipment)
28240	Manufacture of power-driven hand tools
28250	Manufacture of non-domestic cooling and ventilation equipment
28290	Manufacture of other general-purpose machinery n.e.c.
28301	Manufacture of agricultural tractors
28302	Manufacture of agricultural and forestry machinery other than tractors
28410	Manufacture of metal forming machinery
28490	Manufacture of other machine tools
28910	Manufacture of machinery for metallurgy
28921	Manufacture of machinery for mining
28922	Manufacture of earthmoving equipment
28923	Manufacture of equipment for concrete crushing and screening and roadworks
28930	Manufacture of machinery for food, beverage and tobacco processing
28940	Manufacture of machinery for textile, apparel and leather production
28950	Manufacture of machinery for paper and paperboard production
28960	Manufacture of plastics and rubber machinery
28990	Manufacture of other special-purpose machinery n.e.c.
29100	Manufacture of motor vehicles
29201	Manufacture of bodies (coachwork) for motor vehicles (except caravans)

29202	Manufacture of trailers and semi-trailers
29203	Manufacture of caravans
29310	Manufacture of electrical and electronic equipment for motor vehicles and their engines
29320	Manufacture of other parts and accessories for motor vehicles
30110	Building of ships and floating structures
30120	Building of pleasure and sporting boats
30200	Manufacture of railway locomotives and rolling stock
30300	Manufacture of air and spacecraft and related machinery
30400	Manufacture of military fighting vehicles
30910	Manufacture of motorcycles
30920	Manufacture of bicycles and invalid carriages
30990	Manufacture of other transport equipment n.e.c.
31010	Manufacture of office and shop furniture
31020	Manufacture of kitchen furniture
31030	Manufacture of mattresses
31090	Manufacture of other furniture
32110	Striking of coins
32120	Manufacture of jewellery and related articles
32130	Manufacture of imitation jewellery and related articles
32200	Manufacture of musical instruments
32300	Manufacture of sports goods
32401	Manufacture of professional and arcade games and toys
32409	Manufacture of other games and toys, n.e.c.
32500	Manufacture of medical and dental instruments and supplies
32910	Manufacture of brooms and brushes
32990	Other manufacturing n.e.c.
33110	Repair of fabricated metal products
33120	Repair of machinery
33130	Repair of electronic and optical equipment
33140	Repair of electrical equipment

33150	Repair and maintenance of ships and boats
33160	Repair and maintenance of aircraft and spacecraft
33170	Repair and maintenance of other transport equipment n.e.c.
33190	Repair of other equipment
33200	Installation of industrial machinery and equipment
35110	Production of electricity
35120	Transmission of electricity
35130	Distribution of electricity
35210	Manufacture of gas
35220	Distribution of gaseous fuels through mains
35300	Steam and air conditioning supply
36000	Water collection, treatment and supply
37000	Sewerage
38210	Treatment and disposal of non-hazardous waste
38220	Treatment and disposal of hazardous waste
38310	Dismantling of wrecks
38320	Recovery of sorted materials
39000	Remediation activities and other waste management services
41201	Construction of commercial buildings
41202	Construction of domestic buildings
42110	Construction of roads and motorways
42120	Construction of railways and underground railways
42130	Construction of bridges and tunnels
42210	Construction of utility projects for fluids
42220	Construction of utility projects for electricity and telecommunications
42910	Construction of water projects
42990	Construction of other civil engineering projects n.e.c.
43110	Demolition
43120	Site preparation
43130	Test drilling and boring

43210	Electrical installation
43220	Plumbing, heat and air-conditioning installation
43290	Other construction installation
43999	Other specialised construction activities n.e.c.
45200	Maintenance and repair of motor vehicles
49500	Transport via pipeline
51220	Space transport
59200	Sound recording and music publishing activities
61100	Wired telecommunications activities
61200	Wireless telecommunications activities
61300	Satellite telecommunications activities
61900	Other telecommunications activities
62011	Ready-made interactive leisure and entertainment software development
62012	Business and domestic software development
62020	Information technology consultancy activities
62030	Computer facilities management activities
62090	Other information technology service activities
63110	Data processing, hosting and related activities
63120	Web portals
71111	Architectural activities
71112	Urban planning and landscape architectural activities
71121	Engineering design activities for industrial process and production
71122	Engineering related scientific and technical consulting activities
71129	Other engineering activities
71200	Technical testing and analysis
72110	Research and experimental development on biotechnology
72190	Other research and experimental development on natural sciences and engineering
74901	Environmental consultancing activities
74902	Quantity surveying activities
80200	Security systems service activities

84220	Defence activities
95110	Repair of computers and peripheral equipment
95120	Repair of communication equipment
95210	Repair of consumer electronics
95220	Repair of household appliances and home and garden equipment