Background document Wales

Document prepared for the Welsh peer review

Orkestra – Basque Institute of Competitiveness
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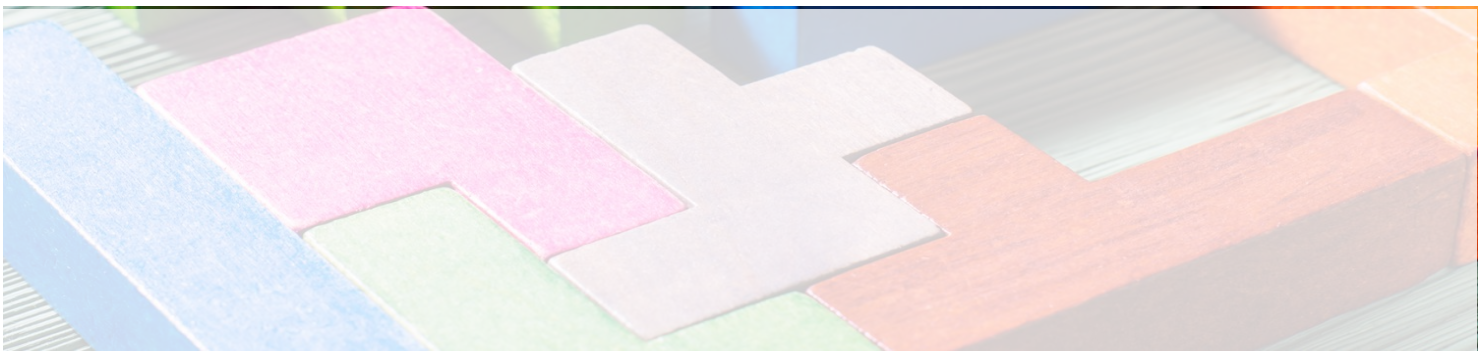

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Introduction and objective of the peer review exercise in Wales

What is a peer-review and the role of a background document?

This document constitutes the first step of the peer review of Wales, which is a learning exercise part of the Manumix project.

Peer reviews can take different approaches, as explained by Nauwelaers (2015), from which OECD and EU peers reviews can be highlighted, mostly focused at the national level. In addition peer reviews at the regional level have been pushed in the last years by both the Interreg programme and the Joint Research Centre (S3 Platform), the latter focused on Smart Specialisation Strategies. Some peer reviews are very intense in time and are proposed to answer a narrow question, while others focus on more broad aspects. This is the case of this exercise within the Manumix project.

The objective of a peer review exercise is not transferring good practices from peers, but to enlighten a process of policy learning. It is important not to forget that in regional innovation policies there is not a single recipe or 'one size doesn't fit all' (Tödtling and Trippl, 2005) so the recommendations from peer reviews have to be contextualized in the region after the process has finished.

Generally, three phases can be distinguished in a peer review exercise:

1. Preparation: This phase includes the elaboration of previous material or documentation. This could include a background document, elaborated either by the peered region or by an external expert. The objective of this document is to inform the peers about the policy or issue which will be the focus of the peer review exercise, not to do an analysis or provide with solutions to the peered territory. In addition this phase includes the mobilization of the resources needed for the peer review, which are the persons that will take part in the implementation phase from both the peered and the peers.
2. Implementation: This is the phase in which the analysis of the background documentation from the peers and the interactions among the peered, the peers and the external expert (if any) take place. This phase varies depending of the format of the peer review exercise. It could take a year or a month and of course the result and in-depth analysis resulting from the exercise varies depending of this format. It normally includes meetings among the participants of the peer review, but also workshops are an option for the implementation.
3. Incorporation: This includes the dissemination of the results of the exercise as well as defining the next steps that the peer region will follow after a consequence of the exercise.

Objective of the Peer Review for Wales and methodological steps

Wales has set as a goal for the peer- review in Wales to get recommendations that are useful *for action-oriented evaluation.*

The Welsh team that participates in the Manumix project considers this exercise important as the main goal for the team is *to learn evaluation approaches to innovation policy.*

Given the scope of the topic proposed the peer review process will constitute an input for improving existing evaluations in Wales, and therefore will contribute to the regional action plan.

Concretely, the following steps are proposed for the peer review exercise:

1. Preparation: This background document constitutes the main sources of information as well as the baseline document and other sources used in the project.
2. Implementation: From May until the face-to face meeting, which will be held in July 10-11 in Cardiff, the peer region (Lithuania, in this case) and the peered region (Wales) together with the Advisory partner (Orkestra) will review the documentation in order to get the knowledge needed for the face-to face meeting.
3. Incorporation: During this phase, a report that incorporates the results of phase 2 will be produced and that will constitute an input for dissemination in the peer region as well as an input for the action plan that the peered region has to deliver for the Manumix project.

Main concepts for understanding the scope of the peer review

In this section some of the most important concepts that will be useful for the scope of the peer review are highlighted:

Innovation policies and their instruments

Innovation policies have followed a broadening process (Borrás, 2009) in the last years, meaning that innovation is not a unique and much delimited domain but it is transversal to other policy domains. Therefore we can find innovation related goals and activities in domains such as environmental policy or health policy. This dimension of innovation policy gives complexity to innovation policy-making. In addition, there is another phenomenon that has added complexity to innovation policy as well: the sophistication of policy instruments. In the innovation policy field we can find different types of instruments responding to different rationales. Apart from traditional supply-side instruments (i.e. grants, tax incentives), which responds to neoclassical rationales, governments have available demand side instruments (i.e. public procurement for innovation) and softer instruments such as cluster policies, to leverage innovation in a given territory.

Additionally, it is important not to consider only instruments administered at a single level (i.e a region) as instruments from other levels (such as country/ European instruments) also impact regional firms. It is therefore a key aspect to include the multi-level dimension in the policy-mix approach (Magro and Wilson, 2013).

Monitoring versus evaluation:

Evaluation is the *process that seeks to determine as systematically and objectively as possible the relevance, efficiency and effect of an activity in terms of its objectives, including the analysis of the implementation and administrative management of such activities* (Papaconstantinou and Polt, 1997). It relies on *collecting and analysing evidence, and drawing conclusions and recommendations from this evidence (Valovirta, 2002).*

Monitoring and evaluation is not the same concept. Monitoring *usually encompasses all sorts of activities that have to do with the collection and processing of information about the*

achievement of expected results and the degree of implementation of policy measures (Gianelle and Kleibrinck, 2015, p. *2).* Indeed, these authors argue that evaluation only refers to the ex-post evaluation in which impacts and attribution are calculated. But in general evaluation literature monitoring is considered a type of evaluation, the one that is conducted for the purpose of analysing whether a goal has been accomplished and the degree of implementation of certain intervention (Kuznetsov and Sabel 2017). Usually monitoring is linked to indicators, and goals' achievement and it is the most common evaluation exercise taking place during the implementation of the interventions (interim). This leads to policy learning opportunities as it moves from a summative to a formative evaluation (Magro and Wilson, 2013).

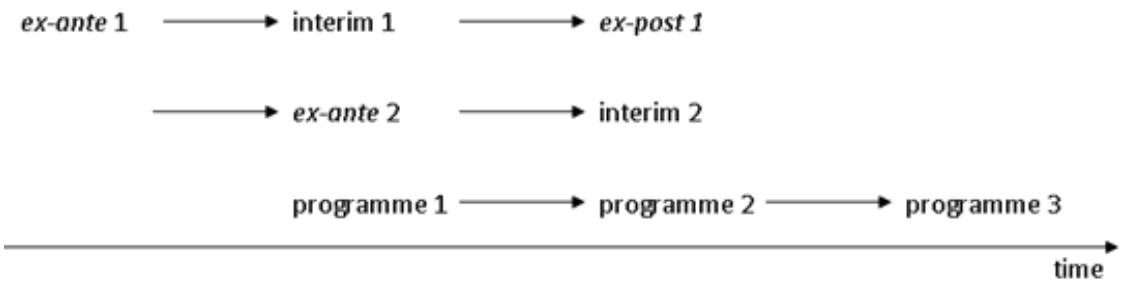
Timeframe for evaluation

As it can be seen in the Figure 1, three types of evaluation can be distinguished according to their time frame (Gibbons and Georghiou, 1987; Papaconstantinou and Polt 1997; Magro, 2012):

1. *Ex-ante* evaluation, which is carried out in the policy design phase.
2. *Interim* evaluation: It is an on-going or monitoring evaluation, running during the policy implementation phase.
3. *Ex-post* evaluation: It is the evaluation that is carried out after the programme has been implemented. It aims at analysing the main results and effects that can be attributed to the programme's intervention. In the case of innovation, these effects could last in time as innovation results last to appear in practice.

As the Figure 1 shows there is a time gap between ex-ante and ex-post evaluations and consequently, they are understood as separate activities with no connections. That means that in the design phase the only results that could be incorporated are the ones from interim evaluations, which shows the high importance of these types of exercises for policy learning processes.

Figure 1: Timeline for evaluation



Source: Gibbbons and Georghiou (1997)

Stages in an evaluation process

Although there are different frameworks that divide evaluation in different stages such as the ones provide by Williams (1999) or Polt and Rojo (2002) we could summarise that evaluation is a process that includes a) revision of policy rationales, b) design phase (including definition of the scope, methodology and data), c) collecting data stage, d) analysis of data collected and e) conclusions and recommendations (Magro, 2012).

Methods and techniques

It is important not to confuse evaluation design with evaluation methods and techniques. These are the means for conducting an evaluation and not the evaluation per se. There are different methods for evaluation, and here it is important to highlight that *'one size does not fit all'* and the use of one method or another will be dependent of the evaluation purpose and the type of instrument (or instruments) that are going to be evaluated, alongside with other issues such as data availability, the moment of the evaluation and the expertise of the people conducting the evaluation process.

We can categorise the different methods and techniques according to different criteria, among which we can distinguish qualitative versus quantitative techniques. The former are more useful for evaluating softer policies (such as cluster policies) and the latter are more suitable for harder policies such as R&D policies. However, the best approach to follow within an evaluation exercise is to triangulate techniques (quantitative and qualitative) to obtain more accurate results (Magro, 2012).

Indicators and type of indicators

Indicators are useful for evaluation purposes and especially for monitoring but have to be understood as a mean for reaching a goal (the evaluation) and not an objective itself. In many cases indicators are chosen as a consequence of data availability and do not reflect the issue that wants to be measured. In addition, an analysis and interpretation of the indicators should be done according to the evaluation design and its rationale.

One of the most used frameworks for ordering the innovation indicators is the input-output framework (Navarro, 2011). This framework has been developed in different approaches and therefore we could distinguish between input indicators (those related to inputs of the innovation process), output indicators (those related to direct results from the innovation process) and outcome or impact[1] indicators (those referring to the economic result of the innovation process). In addition process indicators referring to the development of activities can be included in the framework.

Finally, it is worthy to mention that indicators can be simple or composed and quantitative or qualitative. Therefore they can take many forms depending on the object to be measured.

The concept of additionality

One of the most interesting concepts for evaluating interventions (policy programmes) is the concept of additionality. It is a concept linked to the additional role of public policy and something that every policy maker is seeking to measure. Would it have happen the same without the policy intervention? Then is a loss of public money or even a crowding out effect. Therefore, one of the issues to consider when designing an evaluation exercise is whether it is intended to capture additionality effects. Evaluation design and methods will be conditioned for that decision.

According to the existent literature different types of additionality could be measured:

[1] It is important not to confuse impact indicators with impact assessment or measurement, which is linked to the attribution of the intervention's effects on the beneficiaries and the concept of additionality.

-Input additionality: It refers to the measure of the intervention effects on the inputs of the innovation process.

-Output additionality: It refers to the measure of the intervention effects on the outputs of the innovation process. Here we could make a distinction between direct outputs of innovations (such as patents) or the outcomes of such a process (increase of sales due to a new product innovation, for example).

-Behavioural additionality: This is a concept that links with behavioural changes due to the policy intervention. Traditional changes are for example those links to promoting collaboration to innovate.

The additionality concept is behind of measuring impact, as it captures the additional effect or net effect of the intervention. There are some quantitative techniques more useful for capturing additionality (especially input or output additionality) non-parametric quasi-experiments, which are based on cause-consequence relationships and are able to attribute the effects of the interventions over the beneficiaries. In addition, qualitative techniques can also be applied, especially for measuring behavioural additionality.

External vs internal evaluator

One of the debates that we can find both in the academic literature on evaluation and in practice is the question of who conducts the evaluation process, analysing the advantages and disadvantages of internal and external evaluators. However, the decision of carrying out an internal or external evaluation normally depends on the evaluation purpose itself. On the one hand, when the evaluation's purpose is to improve internal processes and management, evaluators tend to internal. Depending on the governance structure, these internal evaluators can belong to a centralized unit specialized in evaluation practices or to decentralized units, normally from the ministry or department in which the intervention is being managed. On the other hand, when the evaluation's purpose is to improve policy learning or knowledge in general evaluators tend to be external (Magro, 2012). However there is not a rule for thumb and the most important issue is to make sure that the evaluator (either internal or external) has all the necessary competences for such evaluation, including the techniques knowledge. In any case, establishing a process of dialogue between policy makers and evaluators is a key aspect for policy change.

How to include evaluation results into policy-making

The use of evaluation exercises is being contested in the last times. From a traditional view in which evaluations purposes were based on accountability and the use of evaluation was directed to legitimate the intervention, there is now a more accepted view of using evaluation for learning and formative purposes. Following that approach, the use of evaluation is a very strategic issue for policy learning and generating change. The use of evaluation is conditioned by several factors (De Laat and Williams, 2014):

- Time and planning of the evaluation: Evaluation makes significant impacts only at certain periods of time (e.g. during the design) so it is important to understand the policymaking cycle and determine the best moment for delivering of evaluation results.
- Ownership and support from senior managers, in order to promote the use of evaluation findings not only for instrumental but also for strategic reasons.

- Evaluation quality as reliability of results depends on the quality of the content but also of the methodologies employed.
- Follow-up the implementation of the evaluation recommendations.
- Involvement of stakeholders, either in the evaluation design or by being part of the evaluation analysis.
- Allocating resources, not only monetary resources, but also human resources with time to dedicate to evaluation exercises.
- Dissemination of evaluation results, as dissemination helps to raise awareness and support the acceptation of the evaluation results.

Innovation Policy Mix for Advanced manufacturing in Wales

Advanced manufacturing in Wales is impacted by instruments of several government scales (EU, UK, Wales) but the ones designed and implemented by the Welsh government are the main instruments and the focus of the Manumix project. The main characteristics of the programmes are included in Table 1.

The Welsh policy-mix addressed by Manumix includes five R&D&I programmes, which have different and complementary objectives and cover from R&D to commercialisation activities, with a broad coverage of the highest TRLs levels, ranging from TRL3 to 8. It is a business oriented policy mix that mainly targets firms.

Table 1. Manumix Advanced Manufacturing policy mix in Wales

Instruments	Objective	Beneficiaries	Type of instrument	Year of Launch/ budget
Smart Innovation	*To increase the innovation awareness and capability of Welsh businesses and assist them to access financial support to grow their investment in R,D&I*	*SMEs, Big companies*	*Economic instrument Grants TRLs from 3 to 8*	2015/ £2m
Smart Cymru	To provide financial support to Welsh businesses to grow their investment in R&D&I	SMES, Big Companies, Group of Firms	*Economic Instrument; Voucher. Horizontal instrument, TRLs from 3 to 7*	2014/ £10.5 million
Smart Expertise	*To increase commercialisation of Research, Development and Innovation (R,D&I) within research organisations in collaboration with industry*	*Universities, Groups of companies*	*Economic instrument Grants TRLs from 3 to 7*	2016/ £4 million
Smart Partnerships	*To support collaborative projects, with a clear focus to increase the capacity and capabilities of Welsh businesses to develop R&D activities by linking them with Research Organisations and an associate, to work on a specific project to develop new products, processes and services in key areas of Smart Specialisation.*	*SMEs & Universities*	*Economic instrument Grants TRLs from 3 to 7*	2016/ part of Smart Parnership

SBRI	*Driving innovation through public sector procurement*	*All possible beneficiaries*	*Regulation National/regional instrument TRLs from 6 to 8*	*2013/ £5m to date*

Source: Baseline Study (Orkestra, 2017).

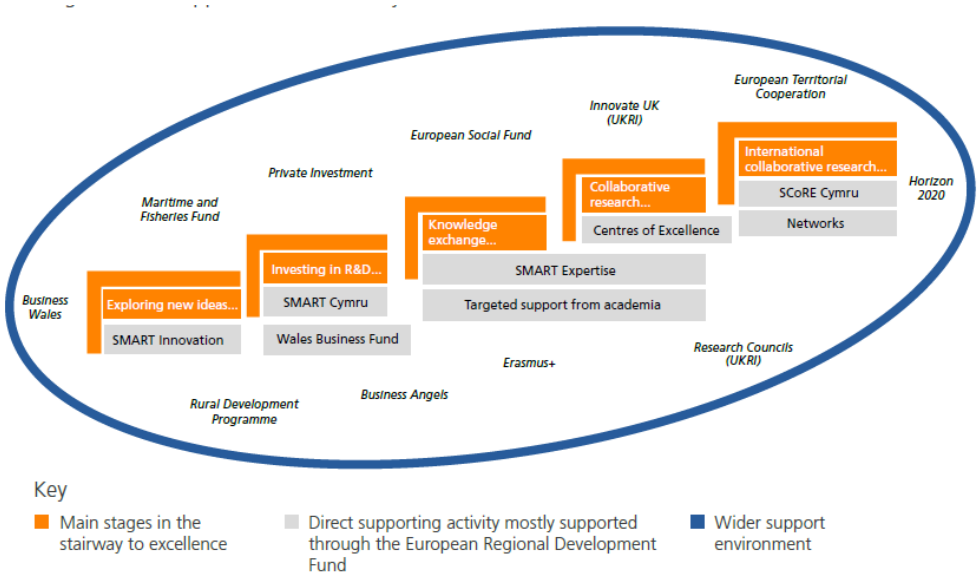
All programmes are responsibility of the Department of Economy, Skills and Natural Resources of Welsh Government. Except SBRI, which is a UK-wide programme designed in collaboration by UK government and devolved administrations, the instruments of the policy mix are designed and implemented by the Welsh government, with the advisory role of Innovation Advisory Council Wales – a body that advises the Ministry on innovation issues. The Welsh European Funding Office (WEFO), an intermediate body that provides finance for collaborative European projects also provides advice on the fit of structural funds with smart specialization strategy.

Table 2. Design, implementation and evaluation of instruments

Instruments	Design	Implementation	Evaluation
Smart Innovation	Department of Economy, Skills and Natural Resources of Welsh Government	WEFO	Welsh Government and external evaluators
Smart Cymru			
Smart Expertise			
Smart Partnerships			
SBRI	Innovate UK, UK Central Government, devolved administrations	Welsh Government	UK bodies

Three of the instruments (Smart Cymru, Smart Innovation and Smart Expertise) are synergic as they target the same group of actors, and the mix has been designed with the objective of improving cooperation. These three instruments are considered to be part of the Welsh "stairway to excellence", an aligned support framework that enables businesses and research groups to improve and be capable of accessing EU funding. In addition, there are several facilitation effects that are perceived among the instruments, although they are not intentional by nature, such as the facilitation that Smart Partnerships leads to Smart Innovation or how leverage the innovation level through SBRI could be an open door to afterwards participate in one of the Smart programmes.

Figure 2. The Welsh stairway to excellence



Source: Welsh Government (2017).

They key points from each instrument are set out below:

Smart Innovation

This instrument aims at increasing the innovation capability of Welsh business by supporting them on R&R&I investment. It offers advice through innovation specialists and other types of supports in areas such as commercialisation, intellectual property, manufacturing and design.

Smart Innovation			
Purpose	To increase the innovation awareness and capability of Welsh businesses and assist them to access financial support to grow their investment in R,D&I	Instrument	Grants
		Intended for	SME Big companies
Sector	Horizontal (orientation to RIS3 priorities).	Year of launch	2015
		Budget	2M£

Description

Types of support included:

- Access to innovation advice & diagnostic through dedicated pan Wales network of Innovation Specialists
- Intellectual Property advice & support and access to subsidised UK-Intellectual Property Office 'IP Audits'
- Specialist Manufacturing & Design consultancy from an approved framework of private sector advisors
- Support to facilitate Technical Collaborations, including Technology Transfer activities between businesses and research institutions
- Support with commercialisation, licensing and Open Innovation opportunities
- Support to access appropriate R,D& I funding sources and advice to develop funding applications e.g. SMARTCymru, Innovate UK and EU Horizon2020

Source: own elaboration based on baseline study and "Key facts Smart Innovation", retrieved from https://businesswales.gov.wales/expertisewales/smartinnovation

Smart Cymru

SMART Cymru is an instrument that provides support to Welsh businesses to grow their investment in R,D&I, through: (1) supporting businesses to introduce innovative technology and specialist knowledge that leads to the commercialisation of new products, processes and services, (2) encouraging businesses to undertake technical and commercial feasibility studies to identify opportunities for R&D projects; (3) supporting businesses to develop new scientific and technical knowledge by conducting industrial research, (4) assisting businesses in developing innovative products and processes as a result of new research, and (5) helping businesses exploit the results of their research and development. It thus covers and supports all different phases of the research and development activity to help them develop, implement and commercialise new products, processes and services.

Smart Cymru			
Purpose	To provide financial support to Welsh businesses to grow their investment in R&D&I	Instrument	Economic, voucher
		Intended for	SMEs Big companies Group of firms
Sector	Horizontal (orientation to RIS3 priorities).	Year of launch	*2014*
		Budget	10.5M£
Description			
Funded activities: - Phase 1. Technical and commercial feasibility. E.G. market assessment, patent checks and intellectual property rights validation, desk research and calculations. Result in technical and commercial feasibility report. One-six months. Up to 75% of costs, up to maximum 15.000 £ - Phase 2. Industrial research. Research to develop new or significantly improved products, processes or technologies. 3 – 12 months. Up to 70% of costs, up to a maximum of 100.000 £ - Phase 3, experimental development. The completion of an advanced prototype. 6-24 months. Up to 45% of costs, up to a maximum of 200.000 £ - Phase 4. Exploitation. Costs of launching the product or process, e.g. marketing, trade fairs, product certification. Up to 12 months, up to % 50 of costs, maximum of 20.000 £ Maximum % costs covered dependent on the size of the company, the smaller the higher %)			

Source: own elaboration based on baseline study and Smart Cymru brochure, retrieved from https://businesswales.gov.wales/sites/business-wales/files/documents/Growing%20a%20business/SMARTCymru%20Brochure%20Eng_growing.pdf?ContensisTextOnly=true

Smart Expertise

SMART Expertise aims to increase commercialisation through offering financial aid to innovative collaborative projects between research organisations and at least two companies, that require expertise for industrial problems. The collaborative projects address strategic industrial technical challenge/s with a clear focus on commercialisation and exploitation of new products, processes or services and growth in capacity and capability in key areas of Smart Specialisation.

Smart Expertise			
Purpose	• To address strategic industrial technical challenges with a clear focus on commercialisation and exploitation. • To increase commercialisation of research organisations research in partnership with industry. • To secure competitively won follow-on funding. • Growth of RD&I expertise and capacity in research organisations and industry. • To encourage innovative collaborative partnerships between industry and research organisations.	Instrument	Grants
		Intended for	*Universities Group of firms
Sector	Horizontal (orientation to RIS3 priorities).	Year of launch	2016
		Budget	10.5M£
Description			
It funds collaborative projects, with a clear intention to commercialise, lead by a Welsh research organisation, with at least 2 industrial partners (no limitation of size and location). Level 1 up to 18 months in duration, will be utilised to prove the partnership (if new) and project concept while level 2, (which can be applied for as follow on funding to a successful level 1) will continue the development of the established partnership and project. Level 2, up to 3 years in duration and will be a programme of work on a common industrial need or theme. % of funding: 100% of elegible costs of research organisations, which shall equate to a maximum of 50% of the total eligible project costs. The industrial partners shall provide the remaining balance of the total eligible costs. The funding will be awarded to the research organisation. Eligible costs: personnel costs, depreciation value for equipment purchased for the project, contractual research and consultancy, other operating expenses. (does not cover purchase of equipment)			

Source: own elaboration based on baseline study and Smart Expertise call retrieved from https://businesswales.gov.wales/expertisewales/smartexpertise

Smart Partnerships

This instrument aims to support collaborative projects, with a clear focus to increase the capacity and capabilities of Welsh businesses to develop R&D activities by linking them with Research Organisations and an associate, to work on a specific project to develop new products, processes and services in alignment with Smart Specialisation.

Smart Partnerships			
Aims	• Facilitate the transfer of knowledge and technology with regard to R&D and the spread of technical and business skills • Stimulate and enhance business relevant R&D and training undertaken by the knowledge base. • Provide company-based training for partners to enhance their R&D, business and specialist skills.	Instrument	Grants
		Intended for	SME Universities
Sector	Horizontal (orientation to RIS3 priorities).	Year of launch	2016
		Annual budget	
Description			
It funds the costs of appointing a research associate that will be based in the business to develop and implement a project, which has to meet the research supervisor on regular basis. The collaborative project must be developed by a Welsh research organisation with a Welsh business partner. % funding: 50% of total eligible costs. The business partner shall provide the remaining balance. The funding will be awarded to the research organisation. Eligible costs: associate employment costs, associate development, travel and subsitance, (non capital) equipment and consumables, knowledge base supervisor			

Source: own elaboration based on baseline study and "Rolling call Smart Parnerships", retrieved from https://businesswales.gov.wales/expertisewales/sites/expertisewales/files/1._rolling_call_for_smart_partnerships_-_english_-_pdf_v2_0102.pdf

SBRI

The Small Business Research Initiative (SBRI) is a UK-wide process that connects public sector challenges with innovative ideas from industry. The government makes public challenges that are open to businesses.

SBRI			
Purpose	Driving innovation through public sector procurement	Instrument	EU pre-commercial procurement
		Intended fot	Business
Sector		Year of launch	2013
		budget	5M£ till 2017
Description			
The government launches challenge competitions where Any company can submit an application. The scheme is particularly beneficial for early-stage and small and medium-sized enterprises (SMEs).			

Source: own elaboration based baseline study and on https://sbri.innovateuk.org/

Relevant strategies for advanced manufacturing in Wales

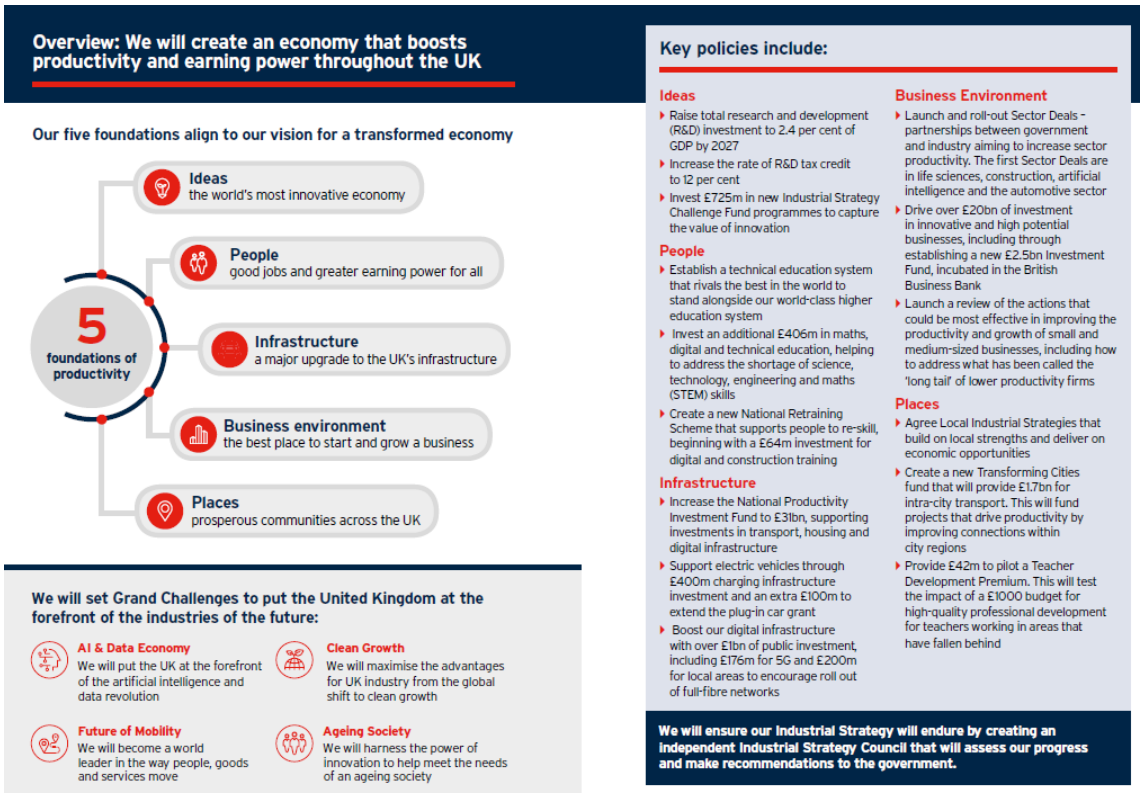
The aim of Welsh government for the peer review is to improve the policy-mix evaluation. Moreover, it has shown interest in analysing not only the alignment of the policy-mix with Welsh strategies but also other relevant UK strategies.

The most relevant strategy to which the policy mix responds is the Smart Specialization Strategy, which is defined in Innovation Wales document. As stated in the Manumix baseline document, Innovation Wales identifies and is organized around four challenge areas: (1) Life sciences and health; (2) Low carbon energy and environment (3) Advanced Manufacturing and materials, and (4) ICT and the digital economy. The Advanced Manufacturing and Materials priority is what constitutes the Advance Manufacturing strategy in Wales, and it compromises several sectors: Automotive, electronics, medical, defence, food, rail, technology and materials. The strategy identifies equally 5 priority areas across all sectors: globalization, innovation and technology, employment, finance for growth and capacity building. Especially relevant within this strategy is the composite materials and compound semiconductor areas.

Among the UK strategies for industrial development and innovation, two strategies are relevant: the UK Industrial Strategy and the Industrial Challenge Fund, which is part of the former.

As illustrated in Figure 4 the UK Industrial Strategy is built around five global ideas which are to be developed through specific policies that aim at contributing to them: innovation, high value jobs and skilful people, improving the infrastructures related to business competitiveness, and the delivery of economic opportunities throughout the different communities and territories of UK. Likewise, the Strategy identifies four grand challenges that are at the same time economic opportunities for the UK: Artificial intelligence & Data Economy, Clean Growth, Future of Mobility and Ageing Society.

Figure 3. Foundations and key policies of UK Industrial Strategy



Source: HM Government (2017

The four challenges identified in the Industrial Strategy are very present in the Industrial Challenge Fund, which is the core programme of the UK Industrial Strategy. This fund is directed to increase science and business through funding research and development in selected industrial and societal challenges. Table 3 provides an overview of the areas selected:

Table 3. R&D challenges selected in the Industrial Challenge Fund

Challenge	Focus
Transforming construction	This challenge aims to transform the construction sector – enabling it to produce safe, healthy, efficient building using the latest digital manufacturing techniques
National Satellite Test Facility	This new facility will enable UK industry to develop next-generation launch technologies and testing capabilities in order to construct satellites and deliver payloads into orbit. It will also allow us to build bigger, more technologically-advanced satellites and test these in the UK.
Creative industries clusters	It will stablish new research and development partnerships that support the definition, design and development of new, creative products and services. Arts and humanities researchers and businesses will work together to make the most of the commercial opportunities and secure the UK's leading position in the global creative economy.
Next generation services	It will support industry and researchers with developing next-generation services (e.g. through technologies like artificial intelligence and data analytics) that can transform the services industry.
Manufacturing and future materials	The government will invest in industry and researchers to develop next-generation composite materials that are more affordable and lighter weight.
Driverless cars	It will fund new collaborative research and development programmes to develop the next generation of AI and control systems

Prospering from the energy revolution	It will fund industry and researchers to create new energy systems. Smart energy systems can intelligently link energy supply, storage and use, and power heating and transport in ways that dramatically improve efficiency.
Faraday battery challenge	Investment in research and innovation projects and new facilities to scale-up and advance the production, use and recycling of batteries, with the aim of lowering carbon and air pollution in the UK, while creating new opportunities and industries.
Audience of the future	Focused on exploiting and developing immersive technologies to create immersive experiences, products and services by bringing creative businesses, researchers and technology experts together to create striking new experiences that captivate the public.
From data to early diagnosis and precisions medicine	Through this challenge the government will fund industry and research to combine data and real-world evidence from the health service and create new products and services that diagnose diseases earlier and more efficiently.
Healthy ageing	Through the healthy ageing challenge, government will bring together UK businesses and researchers to help people to live in their homes for longer, tackle loneliness, and increase independence and wellbeing.
Leading edge healthcare	The government will invest in new facilities and fund research and innovation projects that speed up the development and manufacture of new medicines such as advanced therapies for the benefit of patients.
Quantum technologies	Built on the UK National Quantum Technology Programme the focus is on end users of the devices that quantum promises to transform. Part of this work will involve engaging researchers to turn quantum science into quantum engineering, and manufacturers who can use this to create a whole new set of products.
Robots for a safer world.	It will support industry and research to develop new technologies and systems that can be deployed in extreme environments, for industries such as nuclear and offshore energy, deep mining and space.
Transforming food production	By funding research and innovation projects that build on UK's strengths (e.g. environmental management, sensors, big data, robotics) it aims at transforming the precision agricultural sector.

Source: own elaboration based on information on Industrial Strategy Challenge Fund retrieved from www.ukri.org/innovation/industrial-strategy-challenge-fund

Also, as part of the rebalancing of the UK economy, UKRI/Innovate UK are launching a regional, economic geography and cluster competition – branded as 'Strength in Places' with £115m in the first round. Applications must demonstrate relative economic impact and collaboration between the academic excellence and industrial research base.

Lastly, Welsh city deals can be mentioned as strategies that also foster business growth and innovation. City deals are agreements made between the government of UK and cities, which give the cities certain power to decide how to spend public money and define decisions that affect their areas.

The Cardiff capital city deal is a £1.28 billion programme, which aims at improving several aspects such as infrastructure, housing, transport and business development. In regards business and research and development promotion, the Deal has a priority in developing capabilities in Compound Semiconductor Applications the UK, with the establishment of a Catapult centre in Wales. The deal stablishes that the region will priorities investment in research and development and provide support for high value innovative businesses.

As for the Swansea Bay City Region deal, a £1.3 billion programme, it gives a key place and relevance to Smart Manufacturing. Within this priority, two interventions are included: (1) Factory of the Future, which consist of the creation of a network of smart manufacturing

innovation centres, in order to provide to SMEs with an opportunity to invest in leading edge technologies and opportunities associated with a digital manufacturing revolution. (2) Steel Science Centre. The Centre will focus on providing commercial R&D to address the current and future challenges of sustaining steel-making capacity in the region and the UK.

Monitoring and evaluation

This section presents the main characteristics of the evaluation system and procedure for the instruments of the Manumix policy-mix, including: the content of the evaluation, indicators, methods and sources for data gathering, and the evaluation procedure.

Monitoring and evaluation of Manumix policy-mix instruments

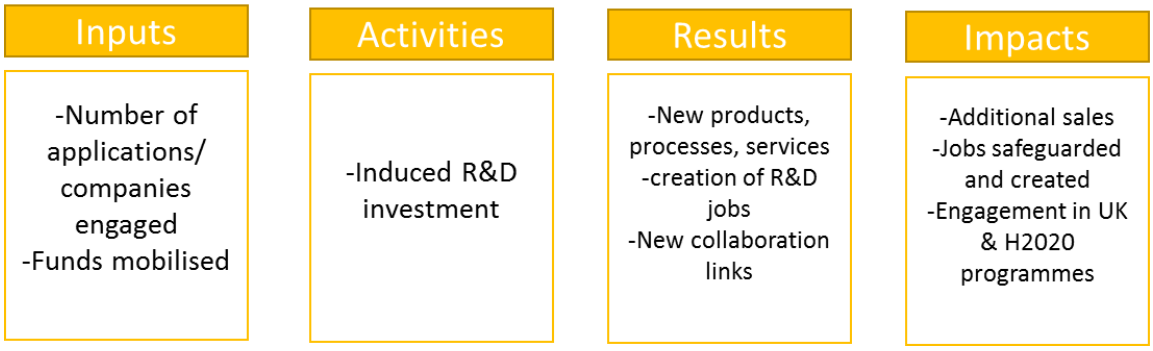
'SMART intruments'

The 'SMART' instruments follow the same evaluation procedure as they share the same target group and are funded by ERDF.

Evaluation frequency: The programmes are evaluated every year

Content of evaluation, timing and indicators: Ex ante evaluation includes the analysis of the quantity of companies engaged with the programmes and funds mobilised; ex-post evaluation focuses on both results (i.e. development or launch of new products and services) and impacts (i.e.) employment generated and saved, including counterfactual analysis in which additionality can be estimated (output and also behavioural additionality). Recently, support must report on the benefits/impacts towards the Well Being of Future Generations Act e.g How would support reduce Carbon emissions. https://futuregenerations.wales/about-us/future-generations-act/

Figure 4: Evaluation and monitoring system for SMART Programmes



Source: Own elaboration

Data gathering. Data is gathered from different sources: surveys and data from beneficiaries and secondary data (from statistical departments and also from open databases.) Data gathering takes into account national and regional data.

Evaluation procedure and actors involved. Three moments can be distinguished: an inception report in which the logic framework for the evaluation is discussed, a mid-point report, which focuses on process more than on results and an ex-post evaluation focused on impact.

In addition, from the European Union there are audits for reporting on outputs, generate payments and creating consistency on reporting.

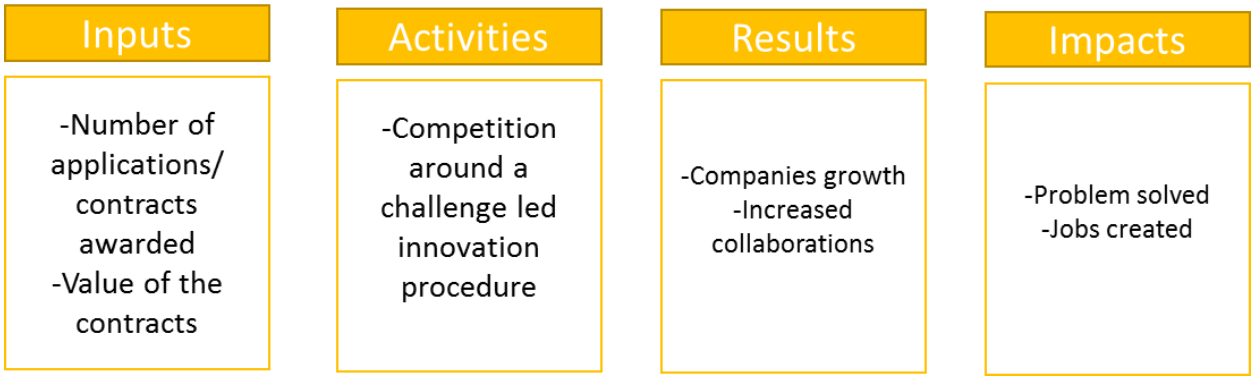
Evaluations are publicly published and the emphasis is put on the firms' progress on stairway to excellence and how they engage in UK and H2020 programmes.

SBRI

Frequency: The programme is evaluated every year by Innovate UK**.** Recent UK Government Review (David Connell) of the programme included researching the differing adoption of the programme across the UK departments and regions. The Welsh Government model (use of a central catalyst fund) was recognised as a model which should be replicated across the UK with a particular focus on Digital and Data challenges – the programme, branded, Govtech has a £20m budget launched in 2018, with 2 out of 5 Challenges selected to receive funding where from Wales.

Content of evaluation, timing and indicators. The evaluation of the SBRI programme is threefold: first it seeks to evaluate the impact of the public sector and the impact on local employees and ultimately the creation of new markets.

Figure 5: Evaluation and monitoring system for SBRI



Data gathering. Data for evaluation comes from two different types of sources:

a) Evaluation indicators (number of projects, used technologies, executed expenditure, new technologies incorporated). Data is gathered through surveys, among other sources, from beneficiaries.
b) Qualitative assessment. Based on the continuous contact with companies best practices with examples are built.

Evaluation procedure. Outputs for evaluation are collected before and after the project is conducted. Welsh contract winners can be funded by other complimentary programmes such as Smart programmes so evaluation of these programmes is somehow linked to this instrument as well.

Conclusions and previous recommendations

In this section, we focus on general conclusions from the background document and provide previous recommendations. This is only to inform the peer review and conclusions and recommendations made here constitute only a starting point of the review process.

The Welsh Government accounts with a wide range of instruments to support SMEs paths towards R&D excellence (by engaging them into Innovate UK and/or Horizon2020). Evaluating the impact of these instruments is an important issue to advance towards policy learning and therefore improve the defined goals.

One of the Welsh strengths is to count with established evaluations of the programme and although they might also be improved, the focus for making better use of evaluation results should be put in other additional factors that go beyond evaluation methods or techniques. Therefore some preliminary recommendations can be highlighted:

- First of all, to plan the design of the evaluation by considering the final goal of supporting the 'stairway of excellence'. That means, allocating resources for that purpose and dedicate time to conduct such a holistic evaluation.

- Secondly, key stakeholders have to be involved form the very beginning. Not only programme managers from the Welsh Government, but also other senior managers form other administrative levels. Among key stakeholders it is important not to forget the role that beneficiaries can play from the very beginning, by participating in the evaluation design.

- Finally, evaluation quality should be considered as a key element and methods and novel approaches to evaluation be explored.

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