



## Funding Innovation

Policy Paper: Scaling Innovative and Creative Companies.

Author: Stephen Crosher

20 February 2017

Version control: Draft\_5



---

*green papers*

Funding innovation	5
Setting the Scene	5
Preamble	6
Greater Use of Financial tools	8
Section 1, Commercialising Innovation	10
Section 2, Investing in Innovation	20
Commentary and Conclusion	24
Commentary on Proposed Tax Shield Schemes Generally	25
Initial Public Offerings (IPO)	26
Conclusion	27
Glossary	28
Appendix A: Commercial Readiness Index, Why is it Required ?	29

## Executive Summary

The UK has exceptional levels of creativity, ideas and innovation within its society. The UK should be at the forefront of wealth creation, increasing productivity and raising living standards. However there is a gap between the generation of ideas and the utilisation of those ideas to build British business, develop exports and create jobs. The challenge for the UK, as many have said before, is how to turn the exceptional level of innovation into longer term wealth generation, new jobs and prosperity.

Some industrial<sup>1</sup> sectors receive far more attention from government than others; science, technology and manufacturing receive more than creative industries. This document addresses how all business sectors involved in innovation, including agriculture, the arts, transport, energy, as well as the technological sectors, would benefit from new policy and support mechanisms.

The UK has reasonable policy mechanisms in place for technology innovation but almost nothing in place for the commercialisation of viable goods or services. Support mechanisms for innovators could be improved by greater visibility of follow-on funds as the innovation progresses through various technology readiness levels. There are also opportunities to explore how government might take more investment positions, perhaps via sovereign wealth or revolving funds<sup>2</sup> to support highly promising businesses.

This paper concentrates on support mechanisms post proof of concept. i.e. those goods or services that appear to be commercially viable. It focuses on mechanisms that would encourage the business to grow by the provision of commercialisation support.

The paper explores the potential for companies and organisations to support innovation through various types of tax rebates and risk sharing mechanisms. In particular: -

- Stamp Duty rebates, to improve building quality and lower energy use;
- Company National Insurance Contributions and/or Corporation Tax, to support economic and social innovation, and the creation of jobs;
- An Inheritance Tax bypass scheme to transfer additional wealth from one generation to the next via socially responsible or economically beneficial organisations;
- Insurance Warranty and Guarantee cover to support businesses without the balance sheet to provide meaningful guarantees.

The paper concludes that there are significant interventions that could be made, with relatively little short term cost to the state, while providing significant medium to long term benefits to the economy and to society. The challenge is how to be imaginative about how new mechanisms can best be used to support the UK in a changing competitive world.

---

<sup>1</sup> Industry is: Any activity conducted by firms or individuals that creates goods or services.

<sup>2</sup> Sovereign Wealth fund & Revolving Fund definition, see glossary

## FUNDING INNOVATION

### Setting the Scene

The UK has exceptional levels of creativity, ideas and innovation within its society. The UK should be at the forefront of wealth creation, increasing productivity and raising living standards. However there is a gap between the generation of ideas and the utilisation of those ideas to build British business, develop exports and create jobs. The challenge for the UK, as many have said before, is how to turn the exceptional level of innovation into longer term wealth generation, new jobs and prosperity.

Some industrial sectors receive far more attention from government than others; science, technology and manufacturing receive more than creative industries. This document is designed to address the needs of all business sectors involved in (or that might become involved with) innovation, from space to agriculture, the arts to information technology, transport to energy, construction to pharmaceuticals, etc.

This paper proposes policies that increase the mechanisms that support innovation and thereby the opportunities for creatives and innovators to develop their businesses, wealth and jobs.

## Preamble

The UK leads in Europe on the levels of innovation (measured by patents registered). There is also a considerable and growing innovation gap (In Europe's favour) between Europe and the US, China, Japan and other leading economies. However the UK lags behind other countries (in both Europe and elsewhere) in commercialising successful innovation. This situation has been acknowledged by many commentators including by the Prime Minister, the Science and Technology select Committee, think tanks including Bright Blue, and the press such as the Financial Times. It is clear that there is a market failure in translating viable innovation into viable businesses.

*It is clear that there is market failure in translating viable innovation into viable businesses*

The causes of market failure in commercialisation is varied. However a major cause is a lack of scale, breadth and depth in UK financial institutions (when compared to the US), to develop the number of opportunities available. Anecdotally (from many discussions) the breadth of choice leads to low risk options being pursued, at the expense of those which could present the greatest opportunity, especially in job creation and wider social benefits. For example CAPEX<sup>3</sup> light companies, such as software developers (where returns can be high compared to the investment) are favoured over higher CAPEX ones, such as manufacturing (where returns can be good but it requires larger amounts of patient longer term capital). This means that CAPEX light companies are favoured by investors, as the level of investment is lower and therefore the risk to reward ratio is better.

A consequence of the lack of breadth and depth in UK funding, is a propensity to underfund good opportunities (especially if capital investment is required), when compared to the US. This situation stifles the ability of innovators to grow, to the detriment of job creation and also to the detriment of the UK's balance position.

This paper focuses on the current significant gaps in government policy is split into two sections. The weight of the papers focus is on policy interventions that would encourage the commercialisation of promising innovation:

**Section 1, Commercialising Innovation**, discusses new policy interventions that could be used to commercialise successful or promising innovation. The section on commercialisation is placed first in the document as this is the policy area that requires a far greater level of attention. It specifically looks at how one might encourage the growth of those businesses that aspire to do so.

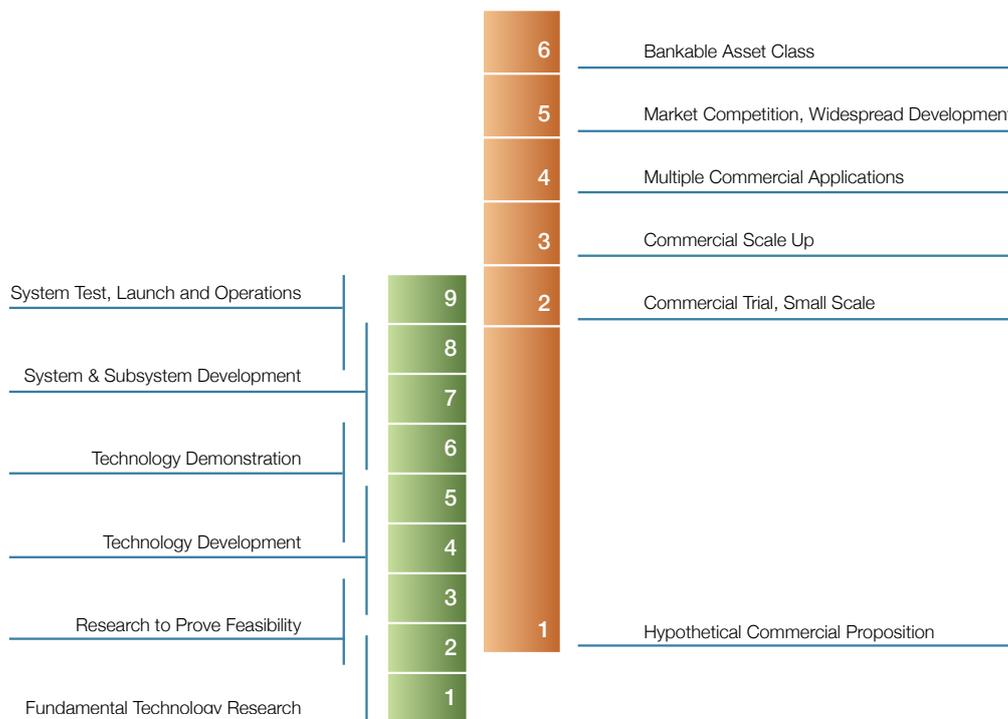
**Section 2, Investing in Innovation**, discusses the funding of initial innovation. It is the authors' view that initial funding of innovation in the UK is reasonably good. It is therefore a section with less detail. However the paper suggests a few specific areas for potential improvement.

It is the view of the authors that there are considerable differences between how innovation should be funded and how to realise successful product commercialisation and business growth.

---

<sup>3</sup> See glossary for acronym definitions

Innovation stages are typically measured by Technology Readiness Levels (TRL), while growing a profitable business is typically measured by Commercial Readiness Levels (CRL). The concept of Commercial Readiness Levels is described in detail in Appendix 1 of this paper. The relative relationship is as follows:



The paper questions whether levels of support should be different for different types of companies. For example, should investors in companies with high CAPEX requirement receive greater levels of Enterprise Investment Scheme (EIS) shielding?

We highlight those types of assistance are better for those companies progressing through their CRLs: ready to launch a product; grow a company and develop a market. This includes various types of tax shielding or insurance type products. The paper discusses, in section 2, the types of improvements to the assistance regime better suited to innovators that are going through the various levels of TRL.

In the real world technology (innovation) development always in advance of commercial development. However, in this paper commercialisation or CRL is deliberately addressed in advance of innovation or TRL as this is the area of policy that requires far greater attention.

The aim of the paper is to explore new and better methods of support, thus ensuring that innovation succeeds. Once successful, the project or service can sold or exported and thus require minimal further assistance.

**Greater Use of Financial tools**

Innovative businesses meet a number of common and significant hurdles. Some hurdles are reasonably well addressed through existing funding mechanisms, while other hurdles need to be addressed by developing new policy instruments.

Different industry sectors have different requirements, however there is also significant commonality. The table below illustrates the commonality by listing typical hurdles for two different industry sectors. The table could be evolved to describe any other innovating sector.

Technology Company	Theatre/ Music Company
Testing of the innovation through various development cycles to de-risk the product	Time and space to rehearse., mentoring, feedback.
Growth of the company to produce full-scale demonstration(s)	Access to sound & light equipment & technicians to operate
Ensuring that the demonstrations are sufficiently representative, of sufficient scale, or numbers to provide statistically meaningful proof of concept	Reviews and mentoring of the quality of the performance
Driving out costs/ improving efficiencies/ answering customers' demands	Support to venues who take initial risks on unproven productions
Removing regulatory and fiscal barriers to the creation of the market	Marketing, promotional materials
Scaling the business from demonstration to early sales and repeated sales	Support to tour/ repeat in multiple venues
Diversification of market/ products to provide greater resilience	Assistance with commercial contracts/ agents/ promoters

Currently innovation funding by government agencies is primarily via:

- Grants to private companies and universities. These grants are generally match funded to a greater or lesser degree. Match funding rates generally vary from 75% to 30% depending on the size of the recipient company and the maturity of the innovation in question, where early stage innovation and smaller companies access high levels of grant support.

- Other government schemes including Regional Growth Funds. These allow access to loans at low or zero interest rates. These loans often have delayed repayment windows and are often longer-term than are available from banks.
- Enterprise zones provide other forms of support, where costs, such as local business rates are discounted.
- Other support mechanisms for innovation include R&D tax credits; Tax breaks for investors under mechanisms such as SEIS and EIS schemes.

The majority of direct government funding of innovation is in the form of grants.

This paper outlines:

- Various potential policy interventions to assist innovators (across all sectors) to scale up their initial business activities, to improve the product, to bring costs down, to assist the innovator to become profitable, to become a growing employer and a long term contributor to the economy.
- Additional tools that government should consider to improve the prospects for new businesses to the benefit of the UK economy.
- Appropriate funding interventions depending on the maturity of the company concerned. The intervention required will vary over the innovation life-cycle.
- Mechanisms that support longer (5 to 8 year) investments, to allow more complex innovation to develop and prosper.
- How government could have greater influence in ensuring that funds are channelled to align with policy goals.

It would be expected that as any specific sector matures government would increasingly withdraw support from from that sector over time.

The policy changes are designed to: favour longer term benefits, especially in those markets where major hurdles exist; align long term policy and funding goals; show how funds could be recycled to enable future beneficiaries.

## SECTION 1, COMMERCIALISING INNOVATION

Chronologically, in terms of developing a product/ good or service, "commercialising innovation" should be after "investing in innovation". However policy mechanisms to support commercialisation are far less developed. For this reason alone commercialising innovation has been given order priority in this document.

**Warranties**

**Description and Commentary**

Companies provide warranties on goods or services sold (in some instances there is a regulated minimum e.g. electrical goods, 12 months).

For warranties to have any real value, the company must have sufficient balance sheet or revenues to support them. Insufficient cash in the business will put it under considerable pressure if the warranty is called upon by customers, eventually to the point of business failure.

It is often the case that the underlying technology is sound, that the repair required may be relatively low cost, but the operational costs (and the business distraction) to put that fix in place is too large for the resources of a small company, leading to business failure.

Potential customers who consider buying early stage innovative products from small companies are usually aware of the risks associated with an insufficient balance sheet (or revenues) to deal with warranty claims if they arise. The lack of balance sheet makes it difficult for innovators to sell to larger sophisticated buyers. This situation curtails the innovator's ability to grow, to arrive at the point where revenues generated can support the warranty risks. This is often a catch-22 situation for small businesses.

**Potential for Government Intervention**

Warranty is an area where government could provide support to innovators, via the provision of warranty cover in some form (which would vary from business to business depending on need).

Warranty support would provide confidence for early adopters to buy new goods or services. The sales would provide funds to the innovator without significant risk to the buyer.

A warranty support mechanism would help uptake, without significant cost to government. The purpose of the support would be to increase uptake of the product or service from the innovator, thus putting them on a more secure financial footing, more quickly, lowering risks for all concerned.

Government could provide warranty cover for a certain period of time; for a certain number of products sold; have a cap on the cover provided e.g. 80%, 65% or 50% (so some risk still resides with other parties); opt to provide a first or second risk position.

Risks could be spread via the insurance market, i.e. government would pay the insurance premium in part or full. The insurance market solution may add to overall cost, but would avoid the risk of government departments future budgets being undermined.

Warranty cover might be used to support the innovative company directly in making sales or might be used to support an intermediary. In the example of a theatrical show it might be the theatre owner who receives the warranty of a minimum number of seats sold (clearly there would need to be safeguards in place, such as sufficient marketing). A technology company example might be, where a payment is received to fix a product defect that has materialised during the warranty period.

There are other risks to consider with a warranty in place, such as, middle-men might increase their fees diluting the overall impact of the support. These types of concern would require detailed examination (to prevent misuse) as legislation was drafted.

**Warranties**

**Key Considerations**

The greater the warranty security provided the lower the risks for the innovator and early adopters. There would need to be a balance of risks with the innovative company and their backers.

How might this work in practice?

**Example:**

Government could provide a warranty of, say, 10% of the sale price of goods sold in year one, perhaps 8% in year 2, declining to 2% in year 5.

A £10,000 product would attract £1,000 of warranty cover. Sales revenue of £1,000,000 could provide £100,000 to the business, in the event of a product recall or production shortfall in year 1. The amount would be set at a level sufficient to bring the business through a potentially difficult period (should it arise).

Which party (innovator, backers, government) takes the first risk or major risk will dramatically affect premium rates. As confidence increases in the business, one would anticipate premium rates would also fall.

Warranty provisions could even be structured so that if payout were to occur, the insuring party could receive an equity (or debt) position in the company.

An example where sales increase by 25% per year and premium rates fall by 2.5% per year (premium floor 6%) the exposure would be £86,520 in return for £8.2m of supported sales. It is likely that the additional tax take from increased economic activity would be far greater than the insurance premiums paid, as shown in the table below:

	Year 1	Year 2	Year 3	Year 4	Year 5
<b>Annual Sales</b>	£1,000,000	£1,250,000	£1,562,500	£1,953,125	£2,441,406
<b>Cumulative Sales</b>	£1,000,000	£2,250,000	£3,812,500	£5,765,625	£8,207,031
<b>Warranty Rate</b>	10%	8%	6%	4%	2%
<b>Warranty Commitment</b>	£100,000	£180,000	£228,750	£230,625	£164,141
<b>Premium Rate</b>	15%	12.5%	10%	7.5%	6%
<b>Warranty Cost</b>	£15,000	£22,500	£22,875	£17,297	£9,848

Guarantees	Description and Commentary
	<p>Guarantees are similar to warranties.</p> <p>The principle difference is that a guarantee might be against product performance rather than product recall. For example, the guarantee might be called upon, if a product performed at less than the agreed acceptable rate, say 70% in this example. In this instance there would then be a payment against the guarantee to the early adopter to ensure the agreed level of income is sustained.</p> <p>The guarantee rate is likely to be set at a level that covers costs, rather than provides full desired profitability.</p> <p>Project finance requires that technology is proven and bankable, as the finances are entirely based on delivering an outcome that performs as expected to the guarantee. Project finance constraints makes bringing new technology into an existing market and then scaling it over relatively short time periods challenging (however good the technology potential might be).</p>
	<p><b>Potential for Government Intervention</b></p> <p>Guarantee provisions could be time limited, uptake limited, volume limited or limited by some other mechanism that keeps an appropriate level of risk and costs between parties.</p> <p>The guarantee would be the marginal difference between a benchmarked performance and actual performance. If a product was performing at 65% and the guarantee rate was 70%, the payment rate would be 5%. However if the guarantee rate was 90%, the payment rate would be 25%.</p> <p>Performance guarantees could provide significant confidence in a new product at low cost. The guarantees may require independent verification of anticipated performance or some type of industry average benchmarking.</p> <p>Similar financial products are provided to UK exporters via UKTI's Export finance schemes. This policy paper suggests that similar schemes are evolved for UK innovators to access both domestic and international markets.</p> <p>There is an opportunity to provide some sort of project finance investor shielding schemes whereby part of the under performance risk is covered (this cover can be capped in both time and expense). When dealing with project finance, the total government risk may be less than 1% of the total but this small amount could be sufficient to bring the innovators (at the point of scaling) into contention for being considered in a competitive market.</p>

Insurance	Description and Commentary
	<p>Insuring new technologies, products or services can be difficult to obtain and/or expensive.</p> <p>Insurance can be used in a number of ways, it provides recompense if something physically goes wrong and damage is caused. However it can also provide protection against deposit loss, warranty protection, guarantee protection and/ or any other common or uncommon risks that may exist.</p> <p>Insurance could be the mechanism to provide diversification of risk cover to innovative companies, their shareholders and the early adopters of companies' products.</p> <p>Government has a long-term interest in helping innovators to progress as they will provides long-term economic growth, tax revenues and jobs for the UK.</p> <p>It is currently unfortunate for both the government and taxpayer alike when companies have secured grant funds to develop products and services but then find it difficult to bring the innovation to market for lack of insurance from private markets (or it is relatively too expensive).</p> <p>Lack of adequate insurance can extend the time taken to bring the product to market, thus creating a risk of business slow-down or even closure, leading to redundancies and the loss of the innovation. Extending the time to market also allow overseas competitors to create alternative products or services and to bring them to market faster than the now struggling small business.</p>
	<p><b>Potential for Government Intervention</b></p> <p>Government could consider under-writing different types of insurance (in part or in full) for certain risks, which are challenging or expensive for the insurance market to provide. An alternative would be for government to opt to pay the insurance premiums as part of a support package.</p> <p>The principle advantage of government offering these protections is that they have the ability to diversify risks across technology and non-technology sectors and across different business scales.</p> <p>Insurance support has greater value for the innovator during their growth stages than it does during the innovation stages, i.e. when there are third party stakeholders involved.</p> <p>Insurance could be made available for a flat charge e.g. 5% of costs. Payouts could be set at a percentage of the original cost of production, say 80%, less any value the product has generated or utility provided, less residual value. It could be time limited depending on anticipated life.</p> <p><b>Example:</b></p> <p>A product has been designed to meet certain certification requirements, but the full process to certify will take several years to complete. The product may not be insurable (or bankable) until the process is complete. The business opportunities would be severely curtailed until the product becomes fully certified. The use of insurance to allow some sales to progress during the certification period would allow products to come forward in the market faster. Additionally, because there is greater confidence in the accessibility to market, it allows greater confidence for the innovator (and their backers) to commit resources to monitoring, improvements and cost reduction.</p> <p>The value of underwriting some of the risks faced by different parties should not be underestimated. The net result is a better product faster than would otherwise have been the case.</p>

**Tax Shield**

**Description and Commentary: Inheritance Tax Bypass Scheme**

**Scheme # 1**

It would be possible to use a variety of other taxes, such as inheritance tax (currently levied at 40%), to allow individuals to invest in innovation commercialisation schemes. The scheme could operate in similar ways to SEIS and EIS investment mechanisms that already exist.

The benefit of using inheritance tax is that the commitment to invest is made by one generation, while the benefits are provided to the next. An individual could opt to put a percentage of their inheritance tax liability into a fund (or company) that is dedicated to the commercialisation of innovation. Rather than the original individual benefiting, it would be their dependants who would benefit from increased value in the future.

A secondary benefit would be that longer term investments are likely to become more appealing.

The inheritance tax exemption can be considered similar to current Business Relief arrangements allowable at 100%.

The thinking is that (as part of wider inheritance tax reform) to be able to pass on substantial wealth from one generation to the next, there should be wider societal benefits. The mechanics of the scheme would need careful thought, if implemented.

**Mechanism Example**

**Example of the scheme in operation:**

An estate has an inheritance tax liability of £160,000 against a £400,000 taxable estate value.

The scheme proposes that £160,000 of it could be diverted by the individual (via their will), or perhaps by the beneficiary, to be used to support innovation, by it being invested in one or more companies. In this example, without this scheme, £160,000 would have been paid entirely to HMRC.

HMRC will still recover, over a few months, a reasonable percentage of the £160,000 (via other taxes such as the innovating company's PAYE, NI, VAT). HMRC will also receive further tax as the money circulates through the economy (from recipient companies tax, PAYE, NI, VAT, etc.)

In this example, over a period of time (say 7 years), the £160,000 investment in the innovating company(ies) has doubled and has become, £320,000.

The beneficiary would receive £320,000 less their current marginal tax rate (say 40%).

**The up-side to the parties are:**

To the individual: £192,000 they would never have had, but with a 7 year delay.

To the state (initially): Around 50% of the £160,000 via other tax mechanisms and via the innovating companies' spending.

To the state (medium term): New innovation, job creation and tax revenue opportunities and £128,000 tax revenue. (In this example, HMRC's total tax take would be around £208,000).

For the business: Increased likelihood of success, faster times to market, better cash flow.

**Tax Shield**

**Description and Commentary: Building Improvement Rebate**

**Scheme # 2**

One of the greatest challenges society faces is climate change. Conversely tackling climate change and mitigating its effects are an opportunity for innovators. Innovators are essential in solving the problem for future generations.

Commentators on energy policy can now see various routes on how to decarbonise the power network (over 20-30 years). However there is considerably less consensus on how to decarbonise transport, heat and industry sectors.

One challenge is reducing the overall demand for energy and particularly heat in domestic houses.

A major tax levied as property changes hands is Stamp Duty. There are opportunities to use a rebate on this tax to encourage the uptake of measures to increase energy efficiency in homes and to increase the uptake of new products, new delivery methodologies and new innovation in commercial properties. Adjustments to stamp duty could deliver benefits to households in both utility & comfort, with further benefits in cutting bills.

For society the benefits will be a reduction in the demand for heat, helping the transition to a low carbon future, by encouraging investment in energy efficiency. For the UK it would lower the demand for imported oil and gas.

**Mechanism Example**

Currently Stamp Duty is paid by the purchaser. The entire stamp duty amount could be made available to the purchaser for energy efficiency improvements to the property (here may be a time window to complete the upgrades). Delivering energy improvements without cost to the individual.

However, if Stamp Duty were switched to a tax levied on the seller, it would become possible to develop policies to bring forward investment in energy improvements, thus lowering energy demand earlier. The party paying the tax will be the party most incentivised to make improvements, i.e. if it is the seller, improvements should be made earlier than would be the case if it is the buyer incentivised.

An investment today in energy efficiency could be offset against future Stamp duty liabilities, perhaps with a taper to the relief, (e.g. 10 years). The taper is in place as the property owner will be benefiting from the improvements over time.

**Example:** (where stamp duty liability has switched to the seller)

An individual spends £10,000 in improvements in 2017. The property is sold in 2020. The Stamp Duty taper is 10%/year. The relief against Stamp Duty at sale is £7,000.

Clearly the Stamp Duty rebate amount could be limited or capped in several ways, e.g. limited to 50% of total amount of Stamp Duty (though this would tend to limit improvements). Equally Stamp Duty could be shared between buyer and seller, providing both opportunities for improvements.

There would be a short term tax receipt loss to HMRC under the current system of purchaser paying. However, depending how the duty is structured, there could be a bringing forward of tax receipts (in advance of the current Stamp Duty regime) through VAT and company payrolls (those providing the goods and services) as earlier improvements are made to properties.

Tax Shield	Description and Commentary: The Innovation Incentivisation Scheme
<p>Scheme # 3</p>	<p>This scheme uses Corporation Tax rebates to stimulate the early adoption and the deployment of market ready products and services from innovators.</p> <p>A major challenge for innovators is often early sales and then scaling business activities through ongoing sales activities.</p> <p><b>Objectives:</b></p> <ul style="list-style-type: none"> <li>• To stimulate corporates to procure innovative products and services,</li> <li>• To support new innovation by the provision of active and engaged customers.</li> <li>• That the innovations add to the performance, productivity or profitability of the buyer.</li> <li>• That the buyer recognises the value created and continues to buy the product or service over time (even once the product or service is no longer eligible for the corporation tax rebate).</li> </ul>
	<p><b>Mechanism</b></p> <p>The scheme could operate in similar ways to the proposed Apprenticeship Levy (where corporate investment in apprenticeships lowers tax liabilities).</p> <p>A company could offset tax liabilities by procuring innovative products.</p> <p><b>Challenges:</b></p> <p>To design mechanisms to incentivise procurement by corporates from innovating SMEs.</p> <p>To ensure that innovating companies are the beneficiaries rather than the scheme being used as a route to lower the cost of existing products.</p> <p>The policy is in the interests of 4 main parties:</p> <ul style="list-style-type: none"> <li>• The UK as a whole to develop globally leading innovations and new businesses;</li> <li>• The buyer as they are buying innovation aligned to their core business to improve their future profitability;</li> <li>• The innovator as their business is being supported by a buyer to pull innovation through to market and to scale, thereby lowering costs;</li> <li>• For corporate employees, as innovation can raise productivity, allowing wages to rise.</li> </ul> <p><b>HMRC impact:</b></p> <p>As with other schemes discussed in this paper, there could be some impact on HMRC's revenues. The impact will depend on the time point the impact is measured. Much of the initial loss to HMRC will be quickly recovered via PAYE and NIC taxes on individuals and employers as innovation is funded. There will be a further tax take as the money is circulated in the economy. The initial loss to HMRC will probably be around 50%. The overall impact on HMRC funds will depend on the scale of the scheme developed, whether corporation tax rates are lower, raised or stay the same. Lastly, the aim of the scheme is, via increased economic activity, to provide increased employment, increasing tax revenues and lowering social security payments.</p>

Tax Shield	Examples: The Innovation Incentivisation Scheme
Scheme # 3	<p>Example 1: A supermarket buying new software controls for their refrigeration that has the potential to lower running &amp; maintenance costs.</p> <p>Example 2: A high energy use customer who wishes to support an innovative energy provider, e.g. tidal or wave. The energy buyer wishes to support the innovative provider at £0.06/ kWh above market rates for the energy. The company receives a tax rebate for all (or part) of their additional energy costs via rebated power purchase agreement.</p> <p>Eligibility limitations may be required, for example: The innovator may have to be pre-profitable (or in profit for less than 2 years); Products that show benefits over and above the market incumbents; Limitations on the total amount sold via this scheme by any single innovator. Limitations may be by value or by quantity. However, It might prove far simpler to describe what an innovative company looks like (by age, turnover, margin, rate of growth or other metric) rather than to try to list applicable innovations and related quantities or values of that innovation that is applicable.</p> <p>It may also be necessary to exclude subsidiaries of large or established companies, to avoid subsidies being channeled to those who have the means to support complex innovation.</p> <p>It should be noted that a local alternative to Corporation tax rebates might be a rebate on business rates, which may become a tax more within the remit of local authorities, depending how devolution to regional / national assemblies evolves.</p>

Tax Shield	Description and Commentary: The Environmental & Social Rebate Scheme
<p>Scheme # 4</p>	<p>An alternative to the 'Innovation Incentivisation Scheme' is a scheme that could encourage much wider take-up. Rather than using corporation tax, one could devise a scheme that uses employers National Insurance Contribution (NIC) rebates to stimulate innovation uptake.</p> <p>It could be extended to allow companies and organisations (including local authorities) to purchase goods or service that are environmentally beneficial (e.g. energy saving/ support of low carbon generation) or socially (e.g. education outreach) or even aimed at productivity (e.g. training).</p> <p>The objectives, mechanisms and challenges would be similar to the Innovation Incentivisation Scheme described previously.</p> <p>The NIC mechanism would have a number of additional advantages:</p> <ul style="list-style-type: none"> <li>• Companies who might be tempted to off-shore profits would still be incentivised to invest in UK innovation (alternatively they would be paying relatively higher NIC rates).</li> <li>• The NIC route would allow greater and more diverse uptake than corporation tax rebate (as NIC is universal tax for all employers). Government departments and local authorities are incentivised.</li> <li>• The Social and Environmental Rebate scheme would become central to employers Corporate Social Responsibility strategy, in both the private and public sectors, including all levels of government.</li> <li>• A NIC based arrangement would mean that all companies and organisations regardless of size would have the opportunity to undertake socially or environmental acts at little or no cost to themselves while creating considerable benefits more broadly.</li> </ul>
	<p><b>Mechanism Example</b></p> <p>As with the Innovation Incentivisation Scheme the detailed policy mechanisms will require considerable thought, especially in regard to eligibility criteria.</p> <p>Scheme criteria may be narrow at the outset &amp; widened over time (perhaps even with a published roadmap of relaxation policy). Likewise the rebate might be constrained and relaxed over time.</p> <p>Greatest benefits would be created when there are tangible links between the contributor and the beneficiary. For Example, universities may look to support education outreach, music venues might support grass routes tuition, water utilities may fund the reduction of pesticide use, and so on.</p> <p>There is almost certainly a role for aggregators to run a variety of funds, e.g. an energy sector innovation fund; construction innovation fund; education outreach fund, etc.</p> <p>The deliberate aim is for all employers to be able to offset tax liabilities to support environmentally and socially beneficial innovations. The mechanisms to ensure compliance and policing of the scheme are beyond the scope of this document, but would clearly require detailed consideration.</p> <p>There will be Implications for HMRC and tax revenues. The initial impact is likely to be around 50% (as there will be other taxes raised via the circulation money). However reform of NIC, especially for higher earners could entirely mitigate the impact to HMRC while still delivering considerable benefit.</p>

## SECTION 2, INVESTING IN INNOVATION

This section mainly discusses improvements to existing funding mechanisms to assist early stage innovators to progress through the various Technology Readiness Levels.

This section has been placed after Commercialising Innovation, as support for early stage businesses is more developed and established than the provision of support for the commercialisation of innovation.

**Grants**

**Description and Commentary**

A conditional match-funded payment, primarily from government.

Lowers required investment (equity or the companies' own funds).

They are regularly the difference between innovation being developed or abandoned.

They are awarded via funding agencies, such as Innovate UK.

New innovation might go through a series of grant rounds before full commercialisation.

The grant application process includes peer review of viability of technology or product, business plan, market potential and expectations.

Are a peer reviewed process that adds to the stakeholders confidence in the innovation and product.

Government grants typically operate a portfolio approach rather than picking winners.

**Potential Improvements**

Greater certainty over follow-on grants.

- A fast track process on subsequent grant rounds, including higher a likelihood of success (providing milestones have been met). This would help to ensure continuity of priorities and avoid wasting the initial grant moneys spent.
- Allows greater management focus of delivery over and above the fundraising cycle.
- Allows external investors increased confidence in the long term prospects of the business.
- Allows early adopters of the goods or service greater confidence in their purchasing decisions.

Incubation support/ mentoring (provided in addition to the grant award) - the bringing in of experts to assist in those areas of greatest need for the company. Most innovating companies have gaps in their capabilities due to their small size. Additional small targeted external support can create significant benefits. Examples might include:

- IP protection
- Legal agreements
- Marketing materials or market analysis
- Data gathering and analysis

**Equities**

**Description and Commentary**

Cash provided to a company by third parties in exchange for part ownership.

The terms of the investment can (often) give the investor considerable influence over the future direction of the company.

Many early stage innovative companies rely heavily on equity from individuals and markets.

In the UK investors are partly shielded by SEIS and EIS schemes.

Government equities are rare. However some examples include the Scottish Government's SIB and REIF funds and some RGF funds.

Government investments are usually as a junior partner, where they invest pari-passu with a lead investor. Used to provide liquidity or to top-up gaps in funding.

Governments have not been good at benefiting from upsides in successful businesses supported.

As government tends to be the junior partner, investments tend to be more closely aligned to investor priorities rather than the government's or society's priorities.

Currently funding does not seek longer term dividends or revenues from investments. The UK government is reluctant to account for future unknown variable revenues. However this need not be the case, revenues could be viewed as one off bonuses, or revolving funds established.

**Potential Improvements**

Governments could take more diverse and frequent equity positions (as a sovereign wealth fund might).

- A UK sovereign wealth fund investing in companies beneficial to the UK economy and society. Equity can be used to top up funds from share issues to ensure available funds reach target amounts (this is how the REIF fund operates)
- Alignment of investment with policy goals. Requires greater investment knowledge within government and organisational structures across government departments to align interests.
- Grants and investment undertaken in tandem. Increasing value of the grant, the business and the multiplier effect from private investors.
- Greater leadership in aligning public funds with government priorities. Ensuring multiplier effects where private funds become aligned with public priorities.
- Stronger leadership increasing freedom of the recipient business to act in the longer term interest of the UK, rather than being pulled towards the shorter term interests of the investor community. Potentially achieved by share classes with fewer rights to intervene or veto management.
- NB: Many US investments work in this way where founders ability to make decisions are retained.
- Rewards from IPO's dividends or income returned to government (or recirculated in new funds or revolving funds)

**Debt**

**Description and Commentary**

**(Loans, Bonds)**

Loans have traditionally been provided by banks, which assess the long-term viability of the business to be able to repay the loan. Banks often seek various guarantees.

There has been a trend for government, through Regional Growth Funds, to become involved in the provision of debt.

Debt provision is better suited for businesses that have on-going revenues and seek capital to expand, invest, restructure or other such activity. Debt is less well suited to pre-revenue companies (unless the route to revenue & profitability is clear), as there are often degrees of risk and uncertainties being managed.

From the perspective of younger innovative companies (those dependent on equity) loans can be problematic (especially if there is an ongoing requirement for cash). In the event that the company finds itself in difficulty, the equity investors are placed in a riskier position as they rank behind debt providers. In turn means that due to increased risks new cash can be harder to secure, potentially to the extent that the relationships and priorities between debt and equity providers can put the business at risk, to the detriment of all.

Other financial tools similar to debt include convertible loans and mezzanine finance (though rare in young innovative companies).

**Potential Improvements**

For pre-revenue / pre-profitable companies loans could be issued for the procurement of assets (both tangible and non-tangible) or against the value of existing assets, especially if the assets are linked to future revenues.

An example of a tangible asset might be a prototype wind or tidal turbine, which once built and installed will generate revenues. A non-tangible asset might be a film, theatrical performance or IP which could be linked to future sales. A bank is unlikely to provide loans against these assets but government could do so.

There are opportunities to set up Special Purpose Vehicles (SPV) - a separate company that owns the assets or rights. The SPV would buy the asset from the producer, using a loan. The loan would be repaid from future revenues. Alternatively the loan might be convertible to equity.

The SPV mechanism allows a method of supporting a company with a loan to build products, projects, services or develop productions.

The advantage of an SPV arrangement is, If for any reason that the SPV fails to perform in full, it will have a smaller impact on the innovative firm than if the loan were direct. A direct loan might bring down the company, while one through an SPV allows the company to continue to develop and improve their product or service, in time becoming fully commercially viable.

Loans (whether convertible or repayable) by government via an SPV mechanism has enormous potential to bring companies through their initial commercialisation stages.



## COMMENTARY AND CONCLUSION

### Commentary on Proposed Tax Shield Schemes Generally

Aggregators will have an important role in enabling smaller organisations to benefit from the schemes. However there is an essential role for larger organisations, corporates and the public sector to be directly involved in supporting those innovators who will overtime improve the performance of the supporting entity. For example, Network Rail should be directly supporting innovation to improve the railways; Construction companies should be supporting innovation to lower air pollution or waste; Farming to support better land use understanding or chemical use, etc.

Public procurement also has an important role to play. However, currently public procurement still seems to overwhelmingly consider cost over and above other wider potential benefits. This problem has been acknowledged for a decade or more (2007 Lord Sainsbury report; Vince Cable in the Coalition, and many others). There have been policy interventions, reports galore, task forces set up and pressure applied to public sector procurement with very little success.

This paper explores interventions that could be made centrally or locally (a locally derived alternative to NIC or Corporation Tax could use Business Rate rebates). The authors suggest that the policies advocated have the potential to unlock the inertia to innovation highlighted in the both public sector and some corporates. They also have the potential to affect behavioural change across all organisation structures.

Public procurement could become instrumental in creating major commercialisation success by providing a Commitment To Buy Contract to the innovator. The commitment to buy would only be triggered once the innovator has achieved the performance specification required. The MoD operates many contracts in this way. This type of commitment to buy policy/ contract would create demand of sufficient scale so that the market risk becomes a much smaller concern for investors in early stage innovative companies.

As the detail of any specific policy or scheme is developed, it will highlight where risks or potential costs are being allocated. Those who are bearing risks will need to consider those risks carefully when making decisions. A high penetration of innovation on business critical aspects of an organisation would probably be unwise. The schemes outlined in this paper generally place risks with central government, even though the decisions are being made locally in business or other organisations. The thinking is that as the rewards materialise they will primarily benefit the innovators, the buyers of successful products (or services) and national government via increased medium term tax receipts and the beneficial impacts on society more generally.

Outside defence the authors felt it useful to illustrate examples where procurement policy, either directly or via contractual agreements with the private sector, might be delivered.

High Speed2 (HS2) could be required to procure zero carbon vehicles for the removal of spoil from their works in major conurbations. The HS2 has a requirement (in this single project) for around 250 dedicated spoil trucks (with a further order of around 250 as the project proceeds over time). This number of dedicated vehicles would be an order of sufficient scale to build the spoil trucks (the technology is mature enough for a solution to be manufactured) and to refine the costs and performance of the technology. A policy intervention such as this

would deliver both a new business (with many potential future orders) and substantial other benefits, such as a reduction in pollutants in cities.

Heathrow expansion (which is highly controversial and may never be built) could be linked to innovation funds dedicated to solving the largest social barriers in the Heathrow development plans, such as: aircraft noise; zero emission ground transport; local transport links; low emission aircraft; etc.

It should be noted that when government co-invests during the early stages of innovation development, they could realise considerable value in their investments by placing orders for the product or service. It is entirely possible for government to procure new innovative products, below market cost by netting gains in their investment value against the cost of the products being bought. This could be an accounting gain or a real cash gain realised via public stock exchange listing (Initial Public Offering).

Commitment to procure is a mechanism that could be agreed by any level of government, from local authorities, to the devolved administrations, to national government.

Government administrations could issue bonds for specific projects, these bonds could return dividends or interest to the bond holders. The bonds could even be a compulsory levy, such as London used for the development & delivery of the Olympics. Instead of the money being spent with no cash return to those who contributed, there could be a long-term revenue return to those who initially invested (whether it was compulsory or voluntary).

### **Initial Public Offerings (IPO)**

The IPO market is difficult to access for innovating companies, which means that the only realistic exit for an investor is a corporate buyer or large investment management firm. If the government is to become a larger stakeholder in the support of commercialisation of innovative companies, there is an even more pressing need to ensure that the IPO route is available to more growing companies.

The government has a potential role in helping to establish a new market for smaller higher risk entrants to becoming publicly listed. This may be a new market or in some way supporting those innovators undertaking an IPO by making investing in these new offerings lower risk to investors.

The lack of an IPO route for innovating companies needs to be highlighted. However, the detailed operations of such a market are beyond the scope of this paper.

## Conclusion

The structures in place for developing innovation are functioning reasonably well. However there is scope to improve, particularly in providing longer term assurances of follow-on funds and to ensure that funding mechanisms are aligned to the longer term UK policy goals and needs, above and beyond shorter term investor preferences.

The substantial gap in policy is the creation of mechanisms that facilitate young businesses to grow by supporting their entry to market and by helping innovators to secure sufficient revenues to grow. The policies outlined in this paper are designed so that they could be applied to any sector business and industry from hi-tech space to performing arts and everything in between.

Innovation policy currently focuses on the early stages of development, which is perhaps only one third of the effort that is really needed. Policies that support growing a business with ideas and innovation are desperately needed. Policies are required that are able to transform a small business with huge potential into a proven, stable, medium sized business in the future.

## GLOSSARY

CAPEX	Capital Expenditure
CRL	Commercial Readiness Level
EIS	Enterprise Investment Scheme
HMRC	Her Majesties Revenue and Customs
HS2	High Speed 2 (London to midlands proposed rail link).
Industry	Definition: Any activity conducted by firms or individuals that creates goods or services
IP	Intellectual Property
IPO	Initial Public Offering (listing a business on the stock market)
Mezzanine finance	Debt that can be converted to equity, usually ranks below senior debt but above conventional equity in case of default.
MoD	Ministry of Defence
NIC	National Insurance Contributions
OPEX	Operational Expenditure
pari-passu	On equal terms
PAYE	Pay as You Earn (Income tax)
R&D	Research and Development
REIF	Renewable Energy Investment Fund (Scotland)
Revolving fund	A fund where revenues generated are returned to the original fund for re-investment in similar firms or activities.
RGF	Regional Growth Funds
SEIS	Special Enterprise Investment Scheme
SME	Small and Medium Sized Enterprise
Sovereign Wealth fund	A state-owned investment fund that invests in real and financial assets such as stocks, bonds, real estate, precious metals, or in alternative investments. It could include tangible or non-tangible assets (such as IP).
SPV	Special Purpose Vehicle (a company set up to direct investment)
TRL	Technology Readiness Level
UKTI	UK Trade and Investment
VAT	Value Added Tax

## APPENDIX A: COMMERCIAL READINESS INDEX, WHY IS IT REQUIRED ?

The Technology Readiness Level (TRL) index, developed by Stan Sadin (NASA,1974) has become a widely accepted benchmark for technology development and progress, though it can equally be applied to any industry developing an innovative product or service.

The TRL index has been widely adopted by UK funding agencies including Innovate UK. However this index does not properly address the commercial uncertainty and risks during later deployment and growth phases. The barriers are multifaceted including: regulatory; incumbent track record; financial security; conservatism; access to finance, to name a few.

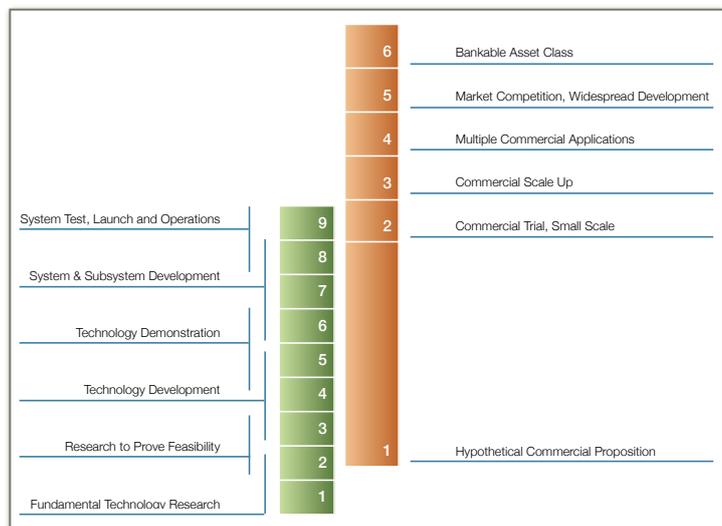
The commercialisation process is well understood. There is a body of literature and knowledge including some well know examples of the challenges, such as, the often sighted ‘valley of death’ for emerging products and services. However this knowledge base has not yet translated into robust policy mechanisms to assist small innovative businesses that have ambition to grow.

A key tool in enabling policy to be developed for the commercialisation phase must be a Commercial Readiness Level (CRL) index. The index enables benchmarking of progress towards commercial readiness. The CRL index used in this paper is derived and adapted from work by the © Commonwealth of Australia (Australian Renewable Energy Agency) 2014. It is licensed under the Creative Commons Attribution 3.0 Australia Licence.

Support for innovators has historically been via the provision of upfront capital grants, which work well to develop initial technology, innovation or services. Yet experience shows that the grant funding model creates risks as it demands rapid movement from innovation to demonstration to a fully functional (mature) product.

Projects that go straight from initial demonstration to rapid commercial scaling face huge hurdles, such as investment commitments, high introduction costs, limited resources, evolving markets, regulation, insurance, immature customer and supplier relationships, customers wariness and many others.

The relationship between TRL and CRL is as shown. Different industries will operate to very different timescales, software development may achieve transition in months while some energy systems could stretch to a decade or more.



To progress through the CRL index a number of critical indicators should be assessed. The aim is to understand the state of the business commercially and to move the innovating business through the CRL stages in a timely fashion, until such time that the product or service is bankable across all commercial readiness indicators.

Commercial Readiness Levels Across Six Maturity Stages		
1	Hypothetical Commercial Proposition	Commercial proposition driven by advocates of the product rather than verifiable or substantifiable claims, generally a product or service that is untested/ unproven. (A innovator will be in this phase for the vast majority of the TRL process period)
2	Commercial Trial	First of kind project in real world conditions, typically funded by stakeholders and grants. Often out of the public domain. The aim is to provide verifiable data or feedback. For some asset classes multiple demonstrations may be required. (The importance of this phase should not be underestimated. It is probable that there will be a number of product iterations at this stage where TRL levels 6,7 & 8 are repeated several times, in order to get the product right. If done well, the scaling to bankable phases will be much more rapid with fewer challenges)
3	Commercial Scale-up	Driven by specific customer demand or policy environment. Use of emerging debt finance. Heavily reliant on success of phase 2, the commercial trials and publically discoverable data driving interest from finance sector/ other 3
4	Multiple Commercial Applications	Regulatory challenges being addressed (perhaps in multiple jurisdictions). Subsidies declining, though still relevant for market growth. Increasing interest from financial markets (breadth & depth).
5	Market Competition, widespread development	Long term policy & regulation understood/ established. Increased supply chain competition lowering costs. Commoditisation of key components.
6	Bankable Asset Class	Standards and performance expectations known. Technology & Business risks are NOT driving investment decisions. Price & market forces driving uptake.

To achieve progress, each stage has a number of key indicators (shown on the following page) that assist with understanding where substantive progress is being made and where further attention is needed.

The indicators (including definitions) are as follows below:

Progress Indicators		
1	Regulation	Maturity of permitting, planning, standards compliance, codes and best practice.
2	Stakeholder Acceptance	Maturity of the evidence based consultation and acceptance of product or service
3	Technical Performance	The availability of discoverable performance information, preferably from multiple sources including 3
4	Financial Performance – Costs & Overheads	Robust information available to buyers or investors.
5	Financial Performance – Revenues	Robust information available to buyers or investors.
6	Supply Chain	Maturity of supply base: Availability of competing parts, services or skills to support long term commercial viability
7	Skills	Transferable skills to support product or service available in multiple jurisdictions
8	Market opportunities	Demonstration of market(s) from hypothetical to measurement of goals & targets against plans, including channels & sustainable business models
9	Company maturity	Development of strong credit ratings and balance sheet. Established accounting and performance metrics.

The relationship between indicators and readiness levels can be illustrated as shown in the table below. Updates on progress can be simply provided to agencies, funders and the companies executive board.

		Hypothetical Commercial Proposition	Commercial Trial	Commercial Scale-up	Multiple Commercial Applications	Market Competition, widespread development	Bankable Asset Class
Commercial Progress Level		1	2	3	4	5	6
Indicators	Regulation						
	Stakeholder Acceptance						
	Technical Performance						
	Financial Performance – Costs & Overheads						
	Financial Performance – Revenues						
	Supply Chain						
	Skills						
	Market opportunities						
	Company maturity						