

ENVIRONMENTAL INNOVATIONS ADVISORY GROUP

EIAG PAPER

Impacts of Testing and Certification

Prepared for the
Environmental Innovations Advisory Group
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EXECUTIVE SUMMARY

The UK lags 25% behind its major American, European and Asian competitors in its ability to commercialise Environmental Innovations. This is not due to a lack of ideas but due to systemic barriers that make it difficult to turn good ideas into successful businesses.

The Joint DTI & Defra Environmental Industries Unit (EIU) is collaborating with the business-led Environmental Innovations Advisory Group (EIAG) to break down barriers to the commercialisation of innovative environmental technologies.

The EIU interviewed 150 former R & D grant scheme recipients in the Environmental Sector to determine the barriers they were facing en-route to market. The Cambridge Institute of Manufacturing conducted additional assessments on 79 of these companies.

Roughly 1/3 of the companies studied identified product "testing and certification" as one of the most significant challenges they faced. Testing and certification or proof of performance issues exceeded any other barrier identified by the businesses interviewed by Cambridge.

Innovator companies identified a number of reasons why they struggled to successfully apply testing and certification en-route to market. These reasons included cost, a lack of testing equipment or standards, or the inability of companies to meet existing standards because their product was radically different.

Looking beneath the surface, it became clear that companies often failed in their attempt to integrate technical assessments into their business plan and route-to-market strategy. Consequently, they failed to penetrate crucial markets, they ran out of funding, or they wasted time and resources trying to overcome challenges that could have been avoided.

Innovator companies are not entirely to blame for this. The testing and certification regime is far from user friendly. It is technically challenging, complex, esoteric and overflowing with terminology. There are reasons for these nuances, but without proper guidance, or scoping, companies can easily underestimate its difficulty or fail to use the system to their commercial advantage. This expert guidance and advice is not readily available to SMEs.

Testing and certification businesses could do more to make their services more user-friendly and accessible to the innovation community (including grant schemes and end users). The emphasis of UK's product assessment regime is largely focussed on certifying finished products. This is important, but neglects the need to document performance of developing products at key stages on the commercial path in order to assess market readiness, reassure investors or manage the risk of product trials or early adopter applications.

There are indications that innovator businesses, especially SMEs are struggling to obtain the private financing required to undertake testing and certification. Grant schemes may want to examine the amount of support provided for testing and

certification. The Cambridge Institute of Manufacturing and venture capitalists report that in sectors where the market pull is not that strong (such as environmental), private finance is difficult to obtain unless enough testing data is available to demonstrate that a product is well established on the path toward certification. The EIU interviewed one company that had received a £45 K grant for R & D, but folded because potential collaborators would not consider its product until it was tested to market standards.

While 37% of innovator companies assessed by Cambridge identified testing and certification and proof of performance as a barriers to commercialisation, only 4% indicated that a lack of British Standards was a factor. More significant were the challenges that innovators faced in achieving certification, suggesting that more emphasis is needed on helping companies achieve certification and in building other aspects of the testing and certification infrastructure: e.g. test equipment and guidance.

Because product certification is often essential to meet minimum requirements of the market, certification delays have the potential to derail the commercialisation of a new technology. An ability to effectively integrate certification into its route to market strategy and business plan are critical if a company is to successfully navigate the certification process and gain timely entry to the market.

1. INTRODUCTION

Establishing market confidence in an innovation is critical to its commercial success. This is especially relevant in the environmental sector, where innovators are attempting to replace tried and true methods of packaging, construction, waste treatment, and manufacturing with more sustainable alternatives. Unless market drivers are in place, purchasers often have little incentive to make this switch, and will be reticent to do so if an innovative product is perceived to be risky. Certification lessens this risk.

Certification offers assurance that a product will meet the expectations of purchasers, regulators and financiers. For many innovations, certification is the key that opens the market door.

Unfortunately, many environmental innovators find product certification out of reach, which can undermine business prospects and has a number of policy implications. Barriers to certification deters market uptake of innovation and slows environmental progress. UK companies lose out to foreign competitors and R & D funding may come to naught, if demonstrated products fail to reach market.

This report identifies reasons why environmental innovators struggle to obtain technical assessments and successfully apply them en-route to market. The report draws from the experience of innovators and information provided by certification bodies, financiers, technology users, grant schemes, insurers and regulators.

The report presents a number of recommendations aimed at making it easier for companies to obtain technical assessments and successfully apply them on the commercial path. These recommendations will help bridge the gap between demonstration and commercialisation, speed the uptake of important environmental innovations and accelerate environmental improvement.

Background

History

The business-led Environmental Innovations Advisory Group (EIAG) was set up jointly by DTI and Defra to identify practical measures to enable greater innovation in the environmental industries sector, and to work with stakeholders to bring about change. The EIAG is composed of leaders in innovator companies, public-private partnerships and venture capitalists.

The EIAG was established in response to findings of the Environmental Innovation and Growth Team Report (IGT), which was sponsored by DTI and drafted by business. The IGT concluded that the world market for environmental goods and services was valued at 515 billion USD in 2000 and was forecast to increase to 688 billion USD by 2010. The present worldwide market is as large as the aerospace and defence sectors and nearly as large as the chemicals sector.

Unfortunately, the UK lags behind its leading American, European and Asian counterparts by 25% in its ability to commercialise innovations (as measured by growth rate and world market share). This difference is especially profound in the rapidly growing renewable energy sector.

The IGT concluded that it was not a lack of knowledge or ideas that impeded UK innovation, but barriers on the commercialisation path that made it difficult for innovators to turn good ideas into successful products. The Environmental Industries Unit has teamed up with the EIAG to reduce these barriers, one of them being the testing and certification process.

Advanced Instrumentation

A UK innovator developed a leading edge monitoring instrument for air pollutants. The company struggled for three years to initiate a government sanctioned testing process and obtain regulator approval for the new method. The process was slowed in part by regulator constraints in supporting an individual technology.

Meanwhile, the technology was spotted by US experts, who within one year had it tested, approved by a regulator/industry task force, incorporated into regulation and had established a US-based manufacturing facility. The technology is now providing superior monitoring results, and a \$300 K US business is looking to sell the UK invention back to Europe.

Evidence Base

The EIU conducted a survey of 150 former DTI Smart Award and Urban Mine R & D grant recipients in the Environmental Sector to determine what impediments they were facing en-route to commercialisation. The Cambridge Institute of Manufacturing supplemented this survey with a more detailed assessment of 79 of these businesses.

In the EIU survey, 28% of innovator companies identified testing and certification as one of the major challenges they were facing. 37% percent of companies surveyed by Cambridge identified certification and proof of performance issues as barriers to commercialisation. The percentage was the highest of any barrier and exceeded:

| | |
|------------------------|--------------------------------------|
| funding for R & D | high capital costs |
| operating costs | lack of public procurement |
| regulatory uncertainty | contact with customers and partners. |

The impact was especially high in the material recovery and recycling and water sectors, where there a few market drivers and conventional options are well entrenched.

The EIU survey was followed up with in-depth interviews of 40 innovator companies who reported testing and certification challenges.

The progress of five innovator businesses in the sustainable construction sector was tracked over a two-year period to assess how they contended with testing and certification challenges. These companies included:

- 2 solar thermal companies;
- 1 photovoltaic company;
- 1 waste-to-brick manufacturer; and
- an inventor of a flood control device.

One of the businesses was large and well established in the UK, one was established overseas but was attempting to grow a business in the UK, three of the businesses would be classified as SMEs, one of which might termed a home-grown business.

We also interviewed a number of stakeholders in the construction sector, including certification bodies and test houses, architects, insurance companies, trade associations and a range of end users from lead adopters to the mainstream market. A report generated by the one of the innovator companies shed useful light on the testing and certification perspective taken by a number of early adopter developers, builders and housing associations.

Finally, the EIU has incorporated the experience of its North American counterparts in the application of environmental technology verification schemes.

This analysis, combined with input from the EIAG has formed the basis for this report. The EIU elected to focus its efforts on the sustainable construction sector, including renewable energy technologies, where testing and certification plays a particularly important role, but the report will also touch upon other sectors.

Technical Assessments: What they are and what they achieve

Independent third party assessments are used to provide unbiased and technically robust documentation of product performance.

For the purpose of this document, the term "technical assessment" will be used to refer to any formal independent third party assessment of product performance. There are many types of assessments, which will not be covered in detail, but will be explained well enough to make the report easier to follow.

"Standards" document the specifications that a user or market requires of a product. Standards serve several purposes. Generally, they collate requirements of a number of stakeholders (e.g. regulators, insurance companies, engineers, supply chains, etc.). This ensures that a product purchased by one party will meet the needs of all stakeholders who have an interest in how a product functions.

Standards also expedite design and procurement process by making it easier and faster to specify product requirements. Products that are not certified to standards take more time and expertise to specify. Most building components, of which there are many, are specified on the basis of certification. This helps explain why meeting a recognised standard is so vital for innovators in markets such as construction.

"Certification" is the most commonly applied assessment and the one that most people are familiar with. Certification documents that a product meets a standard, or other specifications such as regulations. Certification usually involves product testing and is conducted under strict protocols established by overseeing bodies such as UKAS.

Products are normally certified to public standards, but they can also be certified to a private standard (of a company or supply chain) or to no standard at all. A Product Approval, such as an Agreement certification, commonly used in the construction sector, documents that a product or system fulfils a specified function, provided that it is installed in a specified way. It may reference standards, but does not require them. From this perspective they can be helpful to innovations for which there are no standards.

Certification is normally conducted on a finished product in conjunction with its manufacturing facility in order to assure reliability. Certification is intended to provide confidence that the 1,000th product will be as good as the first.

"Verification" documents that a product does what the manufacturer claims. Verifications are particularly helpful in situations where no standards exist or for applications in which standards are normally not applied (processes, such as contaminated land treatment systems for example). Verifications can be applied prior to certification, to give added weight to product trial results for example, or post-certification to bolster market confidence (by verifying successful product performance at early installations, for example).

The need for standards and technical assessments is highly dependent on market conditions. It is practically mandatory for mainstream applications in the new housing market for example, but is not essential in the retrofit construction market. Certification plays a significant role in the sensor and instrumentation sectors.

The accessibility of assessments and how successfully they are applied significantly impacts prospects for commercial success.

Route to Market Barriers

The application of technical assessments is closely linked with a business' route-to-market strategy. An inability to choose the best route to market in the context of testing and certification can block commercialisation. An ability to successfully apply assessments can launch a product forward.

Innovators with a clearly identified market, a well-developed product and straightforward route to market often want to achieve certification as quickly and inexpensively as possible to expedite commercialisation. However, there are a number of challenges that need to be overcome.

Even in a "straightforward" route-to-market scenario, businesses, especially SMEs struggled with scoping, scheduling and budgeting testing and certification and in particular finalising designs and establishing manufacturing facilities in the context of testing and certification. Certification body criterion on what constitutes a "manufacturing facility" is inconsistent and unclear, and created significant confusion for a number of innovator companies.

Business that failed to adequately scope their route-to-market in the context of testing and certification set them on a trajectory to disaster. The allure of the mass market presented a trap to a number of innovators. Because broad market standards can be the most mature and rigorous, in some instances they tended to be the most difficult for innovators to meet due to their prescriptive requirements or high cost. General market specifiers tended to rely on certifications more than those in niche applications, where more case-by-case consideration and expertise was brought to bear and broad insurance liability was less.

One company studied by the EIU set itself on a route-to-market path to the new build housing market, which placed it head-to-head with substantial testing and certification challenges. The company struggled to overcome the barriers for years, building up significant business losses and placing their business in jeopardy. They are now on the verge of bankruptcy despite having a promising product.

Other businesses successfully navigated testing and certification barriers by choosing alternate routes to market (e.g. niche or alternative markets) at the very beginning, to build their business, establish a revenue stream and refine product design before attempting rigorous certification.

In the materials sector, for example it is often necessary to spend a period of time attempting to match up new materials with potential applications to identify the best market opportunity. Innovators may want to apply their product in low risk applications first to identify potential product weaknesses, build market confidence and save on certification costs before shifting over to applications where safety and durability is critical and standards more demanding.

Carbon-neutral Surfboard

An innovator developed a process for manufacturing a carbon neutral material made from hemp. The innovator originally considered using the sturdy material in the construction and automobile sectors, which could provide a large market. However, he soon realised that the safety and regulatory testing and certification requirements associated would be extremely onerous.

He rapidly switched focus to the consumer products sector, where certification requirements are much easier. He is now manufacturing eco-friendly surfboards, has raised the profile of his material and has attracted the attention of a number of large consumer product manufacturers. The prospect for business success is good. The innovator indicated that once the business is firmly established, he might revisit the construction and automobile sectors.

Architects pointed out that at the end of the day, an innovation must fill an unmet market need. If the market demand is there, parties usually find ways to overcome testing and certification challenges of trials or lead adopter applications for example. If the demand is not there, or it has not been tested, a lack of certification can be a red herring for innovations that fail to grab market attention. While certification may open the door to a market, it will not sell a product. EIU's feedback from innovators substantiates these comments.

Innovators can place their businesses at significant risk by pursuing costly certification prior to testing market demand. Innovators indicated that an ability to test a product on the market prior to costly certification, and finalising design and manufacturing processes, was critical for managing their exposure. However, the means to accomplish this presented a catch 22 to innovators who needed the certification to manage the risk of testing the product on the market.

To successfully integrate testing and certification into innovator route-to-market strategies, two elements are needed: good business planning and having the right assessment for the job. The EIU found that environmental innovator companies struggled with both elements.

Business Planning

The experience of innovator companies illustrates that the testing and certification process is not simply a box to tick on the road to certification but is a multi-staged process that raises many difficult challenges. The assessment and certification process must be closely linked to market strategies, financing, establishment of manufacturing facilities and risk management. Good business planning is essential to:

- Take into account the cost of certification plus the implications product failures and design modifications, and first-mover barriers such as a lack of testing facilities;

- reassure investors that the company understands the certification process and is on track toward timely certification.
- schedule certification in alignment with other commercialisation stages. (e.g. design, finance, trials, manufacturing and product launch). Certify a product too late and valuable revenue may be delayed, time it too early and certification may need to be repeated to address design modifications;
- integrate the certification and route-to-market strategies. Alternative market routes may reduce certification barriers or provide vital revenue while certification is being pursued;
- a strategy is needed to test product on the market or trial a product prior to certification;
- assess market conditions to determine which certifications are necessary and whether the gain from certification justifies the investment
- ensure that the product is designed to pass certification and that design is finalised before certification.

Successful Business Planning

A solar company sold end-user collaborators on a design concept early in the commercialisation. He incorporated their specifications into the design and built enthusiasm for the final product. This cleared the way for collaborative product trials without the need for certification and enabled him to establish market interest and a customer base before investing in certification, which reduced the company's exposure.

Innovator companies studied by the EIU avoid certification barriers or the need of certification altogether, with careful business planning and route to market strategies such as:

- partnering with an established firm whose reputation and ability to provide sound product guarantees establish customer confidence without certification;
- offering attractive sales terms to reduce customer exposure;
- collaborating with customers in the product development phase to gain their confidence and interest in the technology;
- entering markets that require less stringent certification;
- limiting product to low-risk or temporary applications; and
- demonstrating compliance with building regulations via a building control officer rather than certification.

Lack of Certification Planning Jeopardises Finance

The Carbon Trust reports that a number of companies have failed to gain funding because they either did not make credible budget and schedule allowances for certification in their business plan or they failed to assure investors that their company was on track for gaining certification

Failure to Test Market Prior to Certification

One company struggled for two years to gain certification for an innovative building material. Since obtaining certification, the company has struggled to sell its product because of its high price.

Experience of innovator companies have shown that the ability to generate sound business plans that take certification into account is undermined by:

- a lack of guidance and specialised business advice on testing and certification
- a lack of a clearly outlined processes for scoping testing and certification
- testing and certification products and services being conveyed in terms of steps to certification rather than in terms of aids to commercialisation.
- Difficulty accessing critical information such as:
 - certification requirements for the market and product trials;
 - identifying and accessing persons who have the necessary knowledge;
 - knowing how to establish a small scale manufacturing facility that meets certification requirements.

Company builds business without certification

A company has developed a sustainable building sealant that outperforms conventional methods. To manage customer risk without certification, the owner initially offered to install his product free of charge at no risk to his targeted customers. By focussing on the retrofit housing market rather than the new housing market, he also avoided stringent lender certification requirements. Over a period of years, his product has gained a solid reputation in the housing industry with which he has built a successful business. Only now is the company considering full certification in order to enter the new housing market.

The right assessment for the job

Certification is often not the best assessment tool to use in dynamic routes to market or for early commercialisation challenges such as product trials or market tests. Certification demands significant resources and time to obtain, which may be wasted if the product or market changes. It may lock the product into a final design or application too early and it may be more robust than needed for the intended short-term and limited application. Certification also requires the establishment of a manufacturing facility, which may not be appropriate in the earlier stages of commercialisation.

Innovators need low cost, rapid assessments that can document product performance, not in the broad market context, but for the commercialisation challenge at hand (product trials, lead adopter application etc.).

Testing and certification bodies have several types of assessments that can offer innovators greater flexibility. The problem is that they are not formalised or promoted so neither innovators nor end users recognise them. This slows the progression of innovation. A number of these options are listed below.

Verifications can be used to address some of route to market challenges. While countries like the US, Canada, Japan and Australia have formal environmental technology verification schemes, that help establish market confidence, the UK does not (although a UK scheme is in development and a verification scheme for instrumentation is in place).

“Pre-assessments” can also be used to provide performance data to end-users in order to facilitate limited technology applications. Pre-assessments are normally used to prepare a product for certification but they are not developed, promoted or recognised as useful tools for innovation. Only rarely have they been applied in the UK to provide end user confidence for the adoption or trial of an innovation.

The EIAG has identified the need for interim approvals or what may be termed “innovation assessments” to help innovators overcome early commercialisation challenges and help end users play a more active role in innovation. Rather than working to broad market requirements, these assessments would assess product performance and safety to a degree that is appropriate for the commercialisation challenge at hand. Remaining risks might be covered by measures such as product guarantees, insurance or by limiting the scope and scale of the application.

The assessments would take advantage of the techniques already used by testing and certification bodies but would formalise them and give them a “market friendly face” so that the innovation community can recognise them and apply them.

The innovation assessment would help innovators:

- Implement a technology trial prior to certification;
- Enter a lead adopter market while full certification is being sought
- Install a restricted number of products to attain the revenue required for full certification;
- Get innovators on track toward certification and assure investors
- Provide performance data when no public standard exists or an innovation does not fit a prescriptive standard;
- Provide assurance to end users or grant schemes that a product achieves the objectives of a public standard, even if it does not meet the specific requirements; and
- Help innovators progress on the commercial path while certification barriers are being addressed.

The innovation would help end-users

- Adopt or trial innovation with less risk;
- Combine a range of risk management tools such as product guarantees, insurance and product testing to manage early adoption risk;
- Provide a public procurers or grant schemes an recognised avenue for innovation;

- Make it easier for end users with little assessment expertise to apply assessments; and
- Manage stakeholder concerns (e.g. insurance companies)

Its key features include:

- Flexibility;
- Affordability;
- Fit for purpose;
- End-user driven;
- A facilitator for public procurement;
- Well promoted and recognized in the market; and
- Applicable to either an individual company or to a sector.

Barriers to Certification

The end game for companies trying to enter certification-intensive markets such as new build construction and instrumentation is more often than not certification. Without certification products generally fail to gain acceptance of the general market.

A number of barriers or innovator mistakes can block or significantly delay certification. These impediments include:

- Lack of standards or inability to meet existing standards;
- Lack of test equipment;
- Technical failures and product modifications;
- Ineffective Standard; or
- Cost.

These are examined in detail below.

Lack of Standards or Inability to Meet Standards

A lack of standards or inability to meet existing standards, due to an innovation's unique approach, can significantly delay certification and market uptake. One company, studied by the EIU has yet to gain certification after a two-year period and has failed to make significant inroads into the market because its unique product did not match the requirements of the existing standards.

A lack of standards is a common barrier encountered by innovators because products generally need to be established in the market for some time to develop the data and market consensus required to lay down broad requirements.

There are a number of ways to cope with a lack of suitable standards. Product Approvals (such as Agreement approvals) provide the technical rigour of certification of a market-based standard, but without the market-based consensus. They are in many respects an ideal certification for a new innovation. One problem however, is many end users, procurers and grant schemes are not familiar with them and do not specify list them as a viable alternative to the accepted market-based standard.

New standards can be created, existing standards can be amended or alternative types of certifications taken be taken advantage of, such as BSI publicly available standards (PAS).

Once again, companies questioned by the EIU tended to either not know about these alternatives, or did not feel confident enough that the iterative certifications would offer the market recognition required, particularly in the case of government schemes that specified that products needed to meet certain standards to be eligible for approval or grant scheme funding. The Agreement Approval was too expensive for one company.

The application of alternative certification may be more effective in niche markets where more specialised and case-by case assessments are brought to bear.

Creating a new public standard requires a significant investment and gaining government or Trade Association support for a single product from a single company proved to be a challenge.

Lack of Test Equipment

If a company cannot test its technology, it cannot refine its product design or gain certification. Consequently, a lack of testing facilities is potentially one of the most detrimental barriers to the commercialisation of innovative technologies.

Overcoming this obstacle may be impossible for an innovator company because the cost of establishing test apparatus can easily exceed the cost of certification. The fact that test houses are commercial enterprises means that they can only afford to construct test facilities if they can recover their investment, which may not be possible if the facilities will only be used by a handful of innovator companies. In such situations, a first mover innovator company may need to wait for its competition to catch up to test its innovation.

A testing equipment shortfall can be exacerbated by the production of standards which specify test methods for which equipment is either not available, or is financially unviable. Rather than bolstering commercialisation, test methods specified in standards can stop commercialisation dead in its tracks, either purposely or inadvertently. Recently, a number of SMEs were knocked out of a building fan market by testing requirements laid out in a new European Standard that small businesses could not afford.

For example, a government grant programme recently specified that to be eligible for the programme, solar technologies must comply with standards for which there were no test facilities in the UK. As a result, innovator companies and grant programmes have needed to delay the implementation of promising UK technologies while opportunities to test the technologies overseas are pursued. For one company, this has created a certification delay of at least one year.

Because a number of European and American countries fund the establishment of testing equipment, UK companies can be placed at a disadvantage, especially if European standards include testing procedures that can only be obtained overseas, especially for SMEs.

Testing Failures and Product Modifications

The need to redesign and retest a product can set businesses back significantly. The BRE reports that while most companies enter the certification process optimistically, a significant number fail their first attempt at certification (90% for safety tests). Businesses may also find themselves having to repeat product testing if to modify their product to accommodate market considerations.

The consequences of repeating the certification process are obvious- additional cost and delay in bringing the product to market. What may be less obvious to innovators is how to approach the testing and certification process in a way that minimises expensive repetition. Certification bodies report that innovators tend to delay engagement with certification bodies, then attempt to rush product testing at the last minute, Consequently, they fail to design in features that will help them pass certification, fail to pre-test their products and do not leave adequate time or budget for product modifications.

This reflects a broader concern that innovators may not be doing all they could to integrate the testing and certification process into their business plans and make allowances for pre-testing, design advice and contingencies for testing failures.

In its interviews with innovator companies, the EIU was often left with the impression that many innovators saw certification as a single step rather than an iterative process of product testing and design refinements.

Ineffective Standard

In some cases, the prevailing industry standard does not match the needs of the innovator or the market. A standard may be overly burdensome or expensive to the innovator (especially a new entrant) but not offer enough market advantage to justify the costs, so it fails to provide a route to market. Alternatively, a standard may not adequately meet the needs of the market and hence become ineffective as a route to market.

Cost

Cost was the most widely reported testing and certification challenge reported by innovator companies, especially small start-up businesses. While the cost of certification can be quite high, a number of innovators that had received £45 K grants were not able to afford the £10-20 K needed to certify their innovation. Why do innovators find certification so expensive? There are a number of reasons.

1. Inadequate scoping: At least one innovator company indicated that when applying for his SMART Grant he based his product testing and certification budget on a brief conversation with a testing facility. When the time came to undertake testing, he found that the costs were much greater than expected.

Early due diligence and scoping is required to anticipate major testing and certification barriers and plan route to market and product design strategies accordingly.

Certification bodies indicate that the scoping certification is a process in itself and can cost £10 K to conduct properly, especially for innovations that may require bespoke testing methods or standards. Without pre-assessment testing it may be difficult to anticipate the extent of design modifications and testing required to achieve certification. This can set up a potential Catch 22 in which grant scheme funding may be required just to scope the need for funding, unless a staged funding process is implemented.

2. R & D Grant confusion and cost overruns: One innovator company expressed concern that testing and certification was not eligible in DTI grants for her project but appeared to be eligible in another project. Being one of the last line items on R & D grants applications, product testing budgets can potentially be devoured by be devoured by cost overruns on product development or trials.

3. First-mover expenses: the need to fund the establishment of certification infrastructure (e.g. test equipment, methods and standards).

4. Uncertainty in recouping investment. Certification can be expensive and even established companies may not consider it to be in their commercial interest to invest in up-front material or labour costs to work through a complex or costly certification process if the return on investment is too long, too uncertain, the product has not been adequately tested in the market.

5. Lack of government funding or private finance: While significant levels of public and private sector funding exists for environmental innovation, the question is whether testing and certification costs are landing in a gap between public and private sector funding. A number of innovator companies have indicated that public funding did not take the product through certification and the private sector has been reticent to fund this process. There are also indications that in some cases private financiers and potential collaborators are less likely to support small businesses until certification has been achieved. For the small inventor and start-up business, certification can significantly boost product credibility.

The Cambridge Institute of Manufacturing has indicated that while private sector funding is often available at the product testing phase for high value products such as pharmaceuticals, in sectors with smaller return potential, such as the environmental sector, private sector funding for product testing is much more difficult to obtain. A venture capitalist specialising in eco-friendly chemicals indicated that while certification would not be required to receive venture capital funding, the innovator company would need to demonstrate it has the certification process well in hand that the prospects for successful and timely certification are good.

6. Inability of businesses to write effective business plans and experience raising private sector funds.

An EIU study of the Environmental Sector concluded that broadly speaking there was substantial private sector funding available in the environmental sector; however, many financiers indicated that businesses struggled to write effective business plans.

Several conclusions can be drawn from these discussions. The first is that a uniform line cannot be drawn across sectors as to when government support for product testing should end and private sector funding be expected to take over as this will be highly dependent on the market requirements and potential rate of return for investors.

It appears that in environmental markets where certification is important, product demonstration in itself will not provide the performance data needed to obtain private sector finance. At a minimum, products must be firmly established on the road to certification and offer evidence that timely certification is achievable. This implies that government funding of gap analysis and product pre-assessments and possibly design revisions and retesting may be required to push environmental innovations to the market. In sectors where market pull is particularly weak, such as alternative materials the government funding may need to extend through product certification.

Product testing and certification can play a significant role in helping companies bridge the "Valley of Death" between demonstration and commercialisation, but only if government funded testing is carried far enough to give the market confidence to carry commercialisation forward.

Barriers to Market Uptake

Certification may open doors to markets, but will it will not sell products. Certification to the existing market-based standard will provide assurance that minimum market requirements are being met, but won't distinguish a product from the competition, nor will it necessarily alleviate purchaser concerns or suspicions regarding an innovative approach. Being able to test the market prior to certification is crucial.

Proof of performance barriers and the role of verification

While certification may open the market door, purchasers often want more evidence of product performance before they will make substantial product purchases. Without this evidence products may linger in early adopter or niche markets.

One of the solar innovator companies being tracked by the EIU conducted a survey of his potential lead adopter customer and collaborators. This survey showed that verification of product performance at actual installations had more influence over their purchasing decisions than certifications. These developers, construction firms and Housing Associations considered certification important for purposes such as insurance, but indicated that their purchasing choices are guided by the performance of existing installations.

Another innovator being followed by the EIU has been struggling to gain listing of their radically innovative method under the Approved Documents of the Building Regulations. Being listed in the building regulations would significantly increase the uptake of this innovation into the new-build housing sector. This radical positive input ventilation system (PIV), which can be coupled with solar heating, had a long track record of successful applications at housing associations, was certified by the British Board of Agreement, had been tested by the Building Research Establishment, and had won the Queen's Award for Innovation. The product had also been shown to reduce asthma in homes by a number of university studies.

Despite its promising track record, the company has struggled to achieve listing for its method under the Approved Documents. Regulators indicated that had the company provided data verifying that it performed according to expectations on new build homes, they would have had more confidence in the technology. Unfortunately, the company had not foreseen the difficulty they would face or the benefit that verifications on installed systems would have provided.

These two examples illustrate that for innovations, the need to prove that innovations perform does not end with certification. The latter example illustrates that for radical innovations such as PIV, which are difficult to understand and replace well-entrenched methods (in this case output ventilation fans), the burden of proof can be extremely high. There is no substitute for showing that an innovation has worked before similar circumstances over and over again. Certification will not necessarily demonstrate this.

The EIU did not get the impression that innovators in the construction sector frequently undertake formal verifications of early installations. Undertaking more of these assessments, possibly under the proposed European verification scheme, could accelerate contribute to the uptake of sustainable technologies in the construction sector.

Standardisation Barriers

The lack of standards, or failure to amend existing standards to reflect the state of technology can seriously undermine the uptake of innovation. The uptake of microrenewable energy technologies for example, is being held back by a lack of standards and accreditation schemes.

Establishing standards can help innovators distinguish themselves from competing methods and build market confidence. The PIV industry is looking at establishing a standard to build confidence in its radical ventilation approach.

Standards can also block out innovation, either intentionally or inadvertently. Government schemes may inadvertently play a role in deterring the uptake of innovation by furthering products that comply with existing industry standards without providing a technically robust route for innovations that fall outside of market standards, such as Product Approvals.

Innovator struggles with flood control scheme

A small company has developed an “install and forget” flood control device for homes that eliminates the need for homeowners to block vents using conventional manual techniques. The product has been enthusiastically received by the Environment Agency (EA), which lists recommended flood control devices as a guide for builders. Unfortunately, the EA cannot list this particular product because its innovative nature does not conform to the requirements of the specified standard and Kite Mark.

Innovation cannot meet Grant Scheme Criteria

A PIV solar innovator spent a year trying to convince the DTI Clear Skies initiative to adopt its air-based system into its programme on the basis that it would meet the same performance objectives as the water-based system, which the Standard specified. Eventually it took locating the last remaining living member of the standard advisory panel to resolve the difficulty.

CONCLUSIONS

Environmental innovators are confronted with a number of challenges in obtaining and applying technical assessments such as certifications. Because technical assessments are so important for instilling confidence in an innovation, assessment challenges and opportunities can come into play at each major stage of commercialisation from product demonstration to market diffusion. An inability to successfully apply technical assessments at any one of these stages can undermine chances for commercial success. Successfully applying assessments can be a key to overcoming commercialisation hurdles.

Barriers fall into several general categories:

- A lack of testing and certification infrastructure (e.g. testing equipment or standards);
- An inability to meet existing standards (due to the different approach taken by the innovation);
- An inability to attain certification due to business consideration such as cost, planning etc. and
- Failure to successfully plan and apply technical assessments in a way that enables innovations to reach market.

Reducing these barriers means building and maintaining the testing and certification infrastructure, making the testing and certification process more user friendly for innovators and providing the right business support where it is needed most.

These recommendations are laid out in greater detail below.

RECOMMENDATIONS

The EIU places top priority on the following recommendations:

1. Produce guidance for innovators on testing and certification and how it can be applied en-route to market.
2. Develop an “innovation assessment” that documents innovation performance for early innovator and end-user applications en-route to market (e.g. trials, lead adopter applications).

Other recommendations are as follows:

1. Continue to track and assess grant scheme recipients to measure success, identify barriers and improve support.

Testing and Certification Infrastructure

1. Build testing capacity by joining up existing resources within the UK, and potentially collaborating with private test houses in situations where there are market failures.
2. Avoid implementing British or European standards if access to testing will prove to be difficult, unnecessarily expensive or lock out important businesses.

Making the Testing and Certification Process More User-Friendly

1. Convey testing and certification services in commercialisation terms, rather than strictly certification terms. In other words, it would be helpful if certification bodies laid out the services and assessments they offer in terms of how it can help to achieve commercialisation objectives.
2. Provide roadmaps to help innovators know what innovators need to do or take into account to successfully navigate testing and certification in alignment with their route to market (for example, provide clearer instruction on how to meet "manufacturing facility" requirements).
3. Government technology programmes, public procurers and grant schemes, which rely on standards to establish eligibility, should ensure that an alternative route for innovation remains open, possibly on the basis of bespoke standards or Product Approvals (e.g., Agreement Approvals). The schemes might also sponsor a route for innovations with lower assessment credential for lead adopter customers.
4. Link up public procurement programmes with the "innovation assessment".

Provide the right business support where it is needed most

1. Government or PPP programmes need to offer expert advice to innovators on undertaking testing and certification, how to incorporate the process into their business plan and provide advice on overcoming barriers. It may be possible to pool resources between organisations to fund expertise. Experts are needed who can broker agreements between market end users, certification bodies and innovators.
3. Provide grant scheme testing and certification support, especially for SMEs in situations where private finance will not be available without a foundation of product testing.
4. Incorporate more testing and certification due diligence and scoping into grant schemes and business support guidance to encourage early consideration of product designs, prevent companies from selecting inappropriate routes to market or being surprised by certification barriers.
5. Examine how technology sponsors might steer innovators toward a more successful approach to testing and certification (e.g. better business planning and strategic use of alternative assessments such as verifications).

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