

PHOTONICS IN SCOTLAND 2021 REPORT



A NETWORK OF

CORPORATE SPONSORS

Foreword

Photonics, that is the technical application of light, is arguably the key enabling technology of the 21st century. Although largely an unseen technology, it has a wide presence in our everyday lives and is applied across a myriad of market sectors.

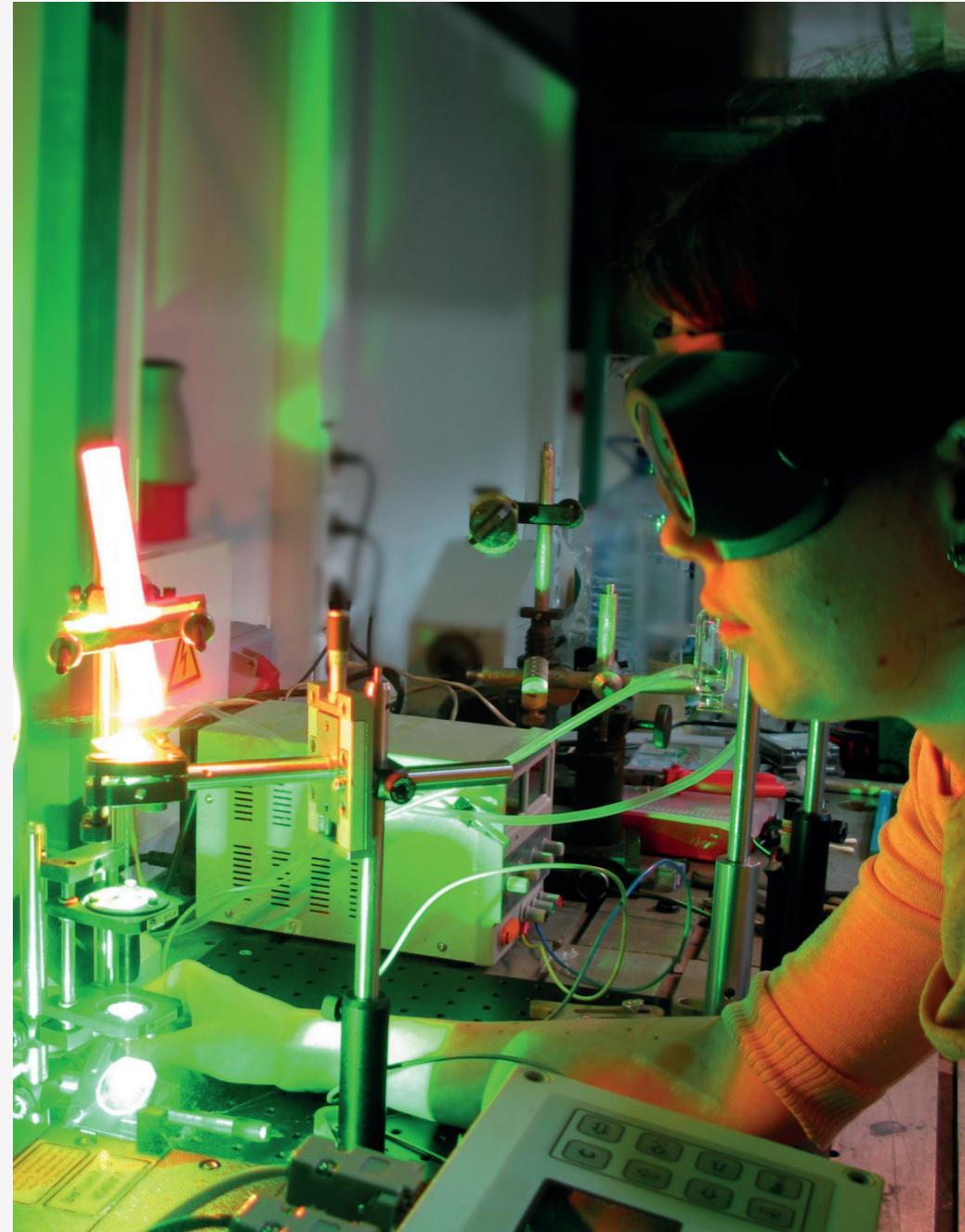
The global photonics market is estimated to be worth £575bn¹, growing at a rate exceeding global GDP at a Compound Annual Growth Rate of 7% since 2015. It is predicted to reach £800bn by 2025¹.

Scotland's photonics sector is estimated to have an output of £1.2bn², and is well positioned to capitalise on this rapid growth, with a thriving industry cluster employing more than approximately 6,500² people supported by an internationally recognised academic base. In 2019, Photonics Scotland published its vision to treble the size of Scotland's photonics industry by 2030, detailing recommendations that will support this growth and maintain Scotland's globally recognised and respected position in the field.

To further inform these recommendations, Photonics Scotland conducted a baseline survey of the sector in 2020, the first such survey carried out in over a decade. In the 12 months since this analysis, the sector has faced not one but two significant challenges in the form of a global pandemic and the UK's exit from the EU. With that in mind, this year's survey provides an important health check for the sector, building on our baseline analysis of last year to monitor the impact of these unprecedented events.

The survey, conducted between April – June 2021, received an encouraging response from our industry partners with around 60% of Scottish photonics companies submitting completed surveys. The key findings are presented in this report.

Photonics has proven itself to be a sector resilient to the impact of the COVID-19 pandemic and stands to play a significant role in Scotland's post-pandemic economic recovery. It will also be key in achieving the Scottish Government's target of reaching net zero by 2045. It is therefore extremely important that we continue to monitor the sector over the upcoming months and years, and provide support to its continued growth, something Photonics Scotland is committed to doing.



Sponsor statements



ENIGMA
PEOPLE SOLUTIONS

Ben Hanley
Founder and Director
Enigma People Solutions

One thing we have learned about the Photonics Industry in Scotland over the past year is the resilience and adaptability of the companies and leaders in this industry and this should be rightly applauded!

One feature of this report will be to show an innovative industry that is in steady growth. With that growth comes into focus a clear challenge and that is talent and staffing.

Enigma People Solutions know first-hand the challenge to identify talent in a market where availability of experienced candidates is under more pressure than ever before in the industry. We do not have enough experienced engineers to fill all the jobs in Scotland through local or locally established talent. There are solutions and the route to successful growth of an industry requires a blended approach of developing and attracting graduates or early career entrants into the industry and training them up whilst also attracting experienced staff from other geographic reaches.

Enigma People Solutions has on numerous occasions helped companies in Scotland identify and attract brilliant talent from around the world to enjoy all that Scotland and the Photonics Industry in Scotland has to offer. These experienced candidates are then used deliver immediate impact whilst also mentoring, supporting and developing those at the early stages of their careers as they come into the job market. Companies that don't have UK work visa licenses are missing out on the talent that can drive their businesses forward.

Technology Scotland's collaboration with Talent Scotland demonstrated how cost effective and manageable the work visa process can be.



SCINTILLA

Peter McBride
Founder and Patent Attorney
Scintilla IP

At Scintilla we are passionate about technology and innovation, from inception to commercialisation and adoption in society. The thriving technology industry in Scotland, as supported by Technology Scotland, is filled with innovative companies looking to change the world. We at Scintilla view it as a great privilege to support these innovators on their journeys.

The photonics sector in Scotland has shown extraordinary resilience during the recent challenges that we have all faced, and it is a testament to the ingenuity and resolve of the local photonics community that they have continued to innovate and push forward under challenging circumstances.

As companies continue to innovate, an effective intellectual property strategy is essential to ensure there is long term growth and sustainability. SMEs and start-ups who have registered IP rights, such as patents, stand out in investment rounds and larger companies benefit from having in-depth IP strategies and a portfolio of diverse registered IP rights.

At Scintilla, we help innovative companies get a grip on their intellectual property. We work with companies to develop and implement IP strategies that align with their business goals. This can include advising on registration of IP rights, such as patents, designs and trade marks; providing innovation and competitor analysis in relation to third party IP rights; and advising on the implementation of IP management procedures within organisations. Our unique commercial approach ensures that IP can be a springboard for business growth.

We at Scintilla are proud to support the photonics community in Scotland and look forward to its ongoing success in the years ahead.

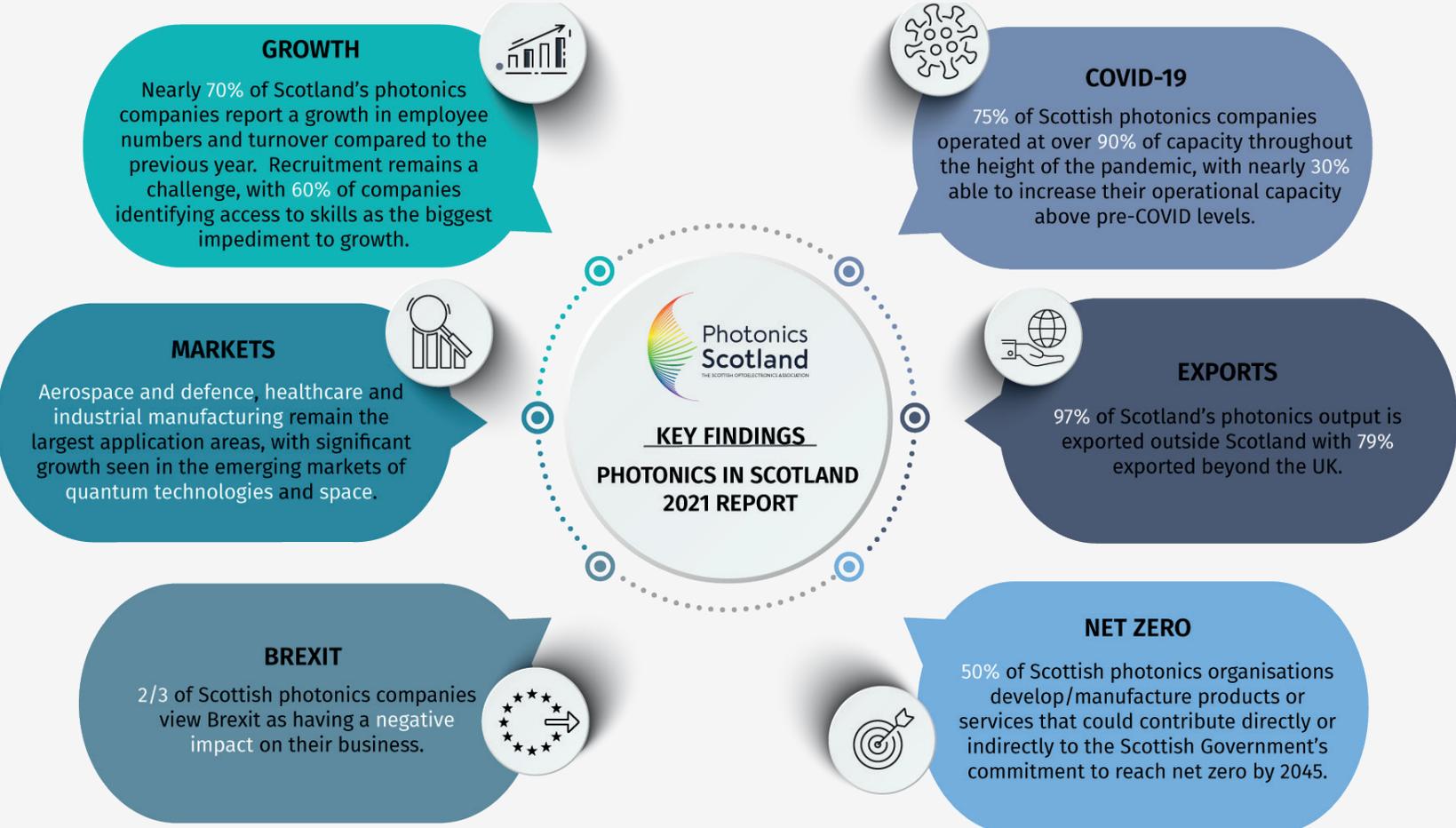
Executive summary

Since our first Photonics Scotland survey was conducted in May last year, the sector has faced the continued dual challenge of an ongoing global pandemic and the UK's exit from the European Union. Yet, despite this difficult backdrop, the sector has proven to be extraordinarily resilient, with 75% of companies operating at over 90% of capacity throughout the height of the pandemic. Indeed, nearly 3 in every 10 companies surveyed was able to increase their operational capacity above pre-COVID levels.

This resilience has supported further growth in the sector, with around 7 in every 10 Scottish photonics companies highlighting a year on year increase in both turnover and employee numbers.

Optimism also remains high for the next 12 months, with the vast majority of companies projecting further growth, accelerated by a buoyant global photonics market that is estimated to reach £800bn by 2025 .

Successfully operating on the global stage will be crucial and Scotland continues to excel in this area, with 97% of output from the sector exported beyond Scotland and 79% beyond the rest of the UK. However, it is vital that we maintain Scotland's position in an increasingly competitive global market and Scotland's future export strategies and internationalisation efforts must recognise and support this buoyant sector.



Executive summary

The diversity of Scotland's photonics sector continues to be a strength, with companies exploiting the demand for photonics products and services in a multitude of application areas. While traditional areas of strength such as aerospace and defence, healthcare and industrial manufacturing remain the largest application areas, there has been significant growth in the emerging markets of quantum technologies and space. These applications offer significant potential for growth over the coming decade and investment in these emerging areas will ensure that Scotland can compete in the global arena. There is also increasing potential in communications, energy and transport, which reflects our increasingly connected world and the challenge to achieve economic growth through sustainable methods.

For the second year running, recruitment has been identified as a key challenge, with 60% of respondents identifying access to skills as the biggest impediment to future growth. It is clear that building the talent pool is key to the sector's growth ambitions and there must be an increased focus on developing the workforce: upskilling of the existing workforce and accelerating entry of new talent from adjacent sectors and our education pipeline, alongside raising awareness of the great career opportunities within the sector.

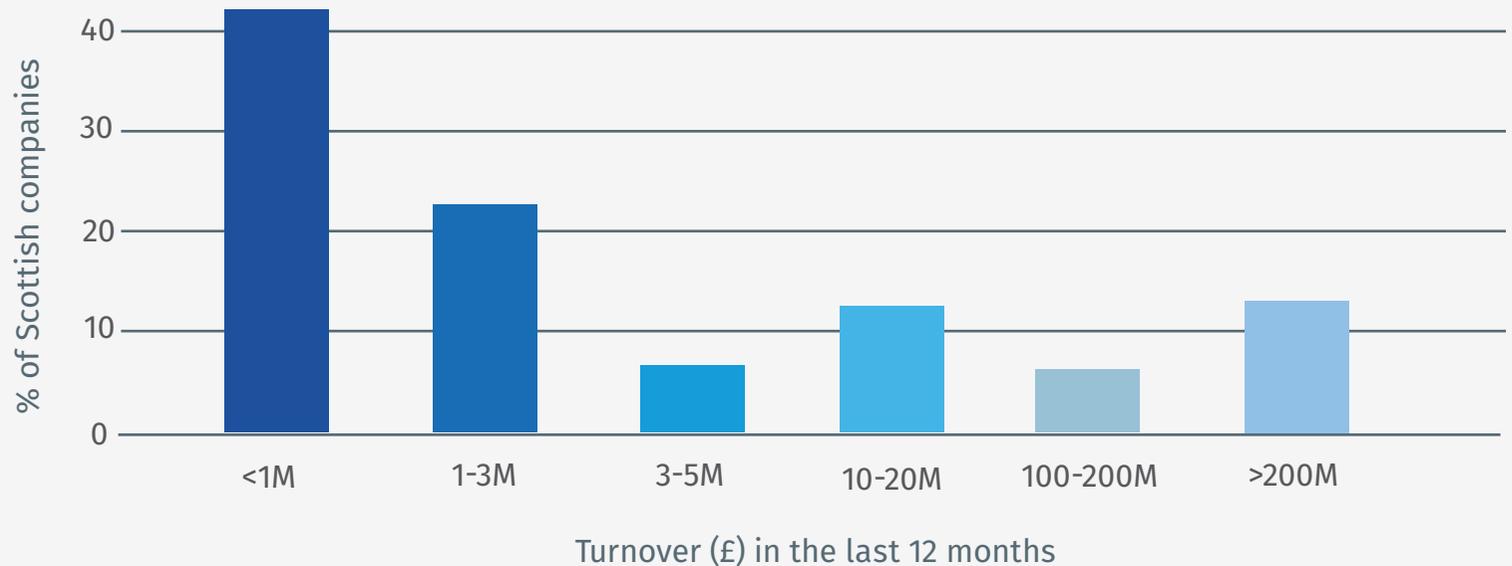
The sector has always relied on the import of talent from the EU and around half of companies surveyed anticipated that Brexit would have a negative impact on this pipeline. Add to this, concerns around import/export delays, supply chain disruption, regulatory issues and access to funding and it is easy to understand why nearly two thirds of companies view Brexit as having a negative impact on their business.

Innovation remains at the heart of the sector with a remarkable 85% of organisations undertaking research and development operations in Scotland. The sector can also boast a hugely impressive 90% success rate in securing innovation funding through the major UK funding channels. In European funding, a success rate of 60% is reported, still significantly above the expected average for the European Framework programme.

Photonics is poised to play a vital role in Scotland's green recovery and underpins solutions for numerous applications that can significantly contribute to sustainability and Scotland's net zero ambitions. From advanced manufacturing techniques which reduce waste and energy consumption, to solar cells and low energy lighting, to precision environmental monitoring, imaging of pollution hotspots and early detection of forest fires, photonics enables a plethora of processes to protect the environment. It is very encouraging to see that half of Scottish photonics organisations are already developing/manufacturing products or services that could contribute directly or indirectly to the Scottish Government's commitment to reach net zero by 2045.

Company landscape

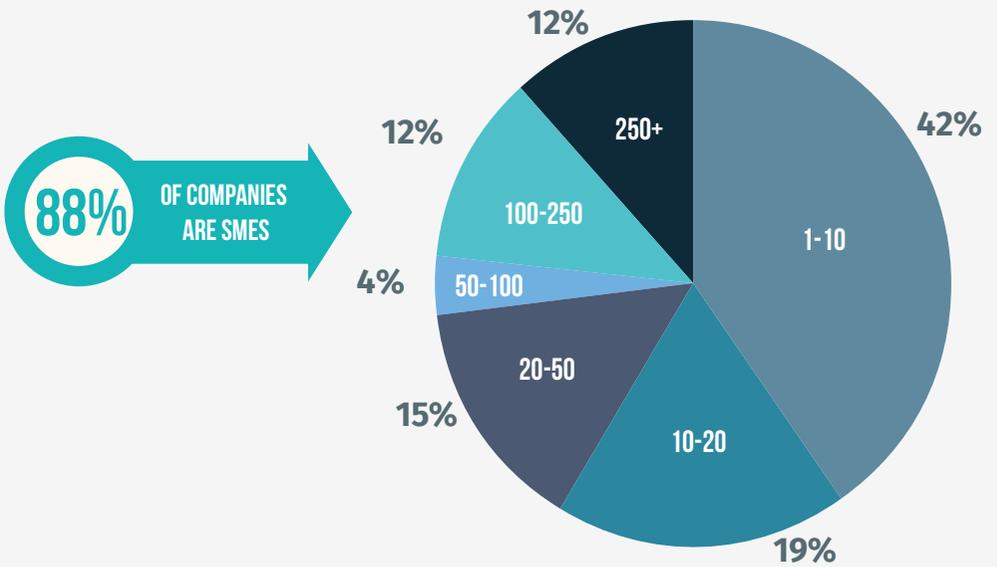
COMPANY SIZE - TURNOVER



SCOTLAND'S PHOTONICS SECTOR

- 
 £1.2bn in output¹
- 
 £98k GVA/employee¹
- 
 ≈ 6,500 employees¹

COMPANY SIZE - NUMBER OF STAFF

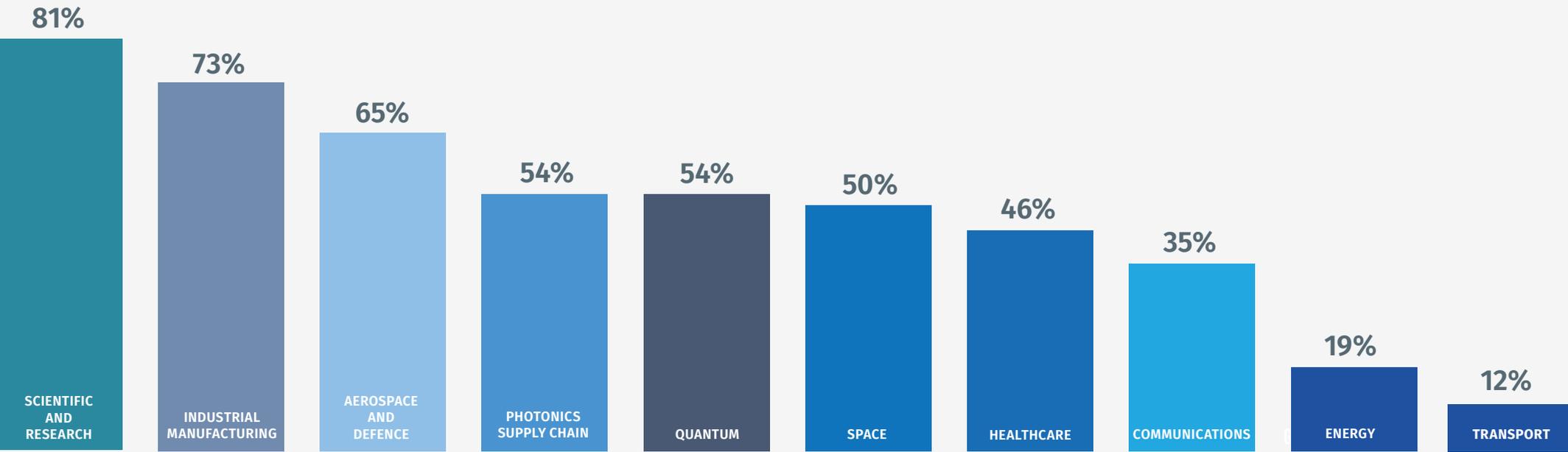



Scotland's photonics sector comprises a strong mix of young innovative SMEs alongside a number of established larger companies. With the right support and investment this SME base offers great potential for growth in a rapidly expanding global market.

OPPORTUNITY

Application focus

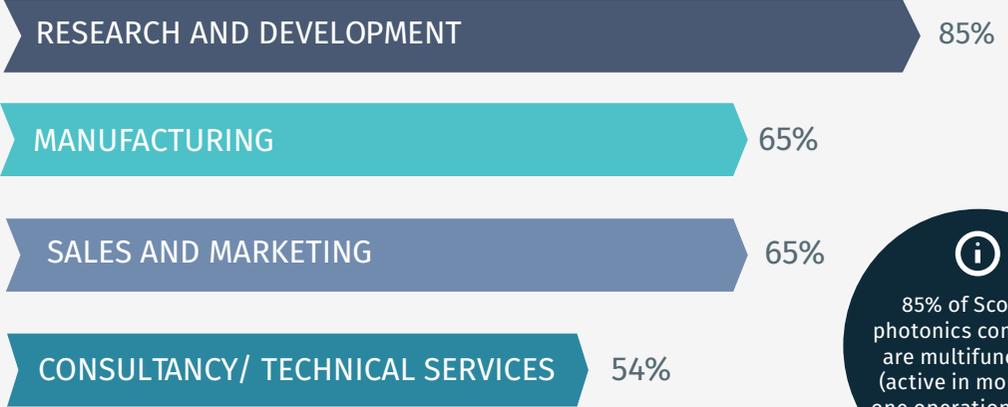
% OF SCOTTISH COMPANIES ACTIVE IN EACH APPLICATION AREA



Significant growth has been recorded in both quantum technology and space applications since last year's photonics survey. These are areas of significant global growth, and investment in these emerging areas will ensure that Scotland can compete in the global arena.

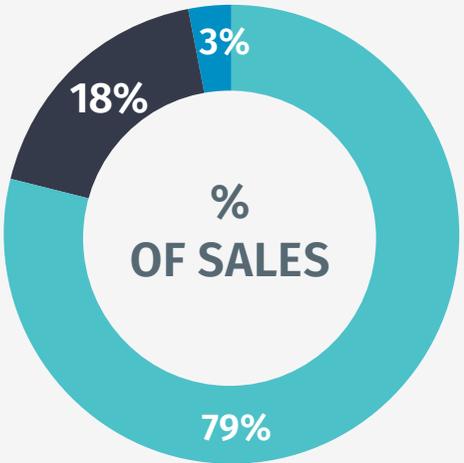
OPPORTUNITY

OPERATIONAL FUNCTIONS OF SCOTTISH COMPANIES



i
85% of Scottish photonics companies are multifunctional (active in more than one operational area)

International markets



■ Scotland ■ Rest of UK ■ International

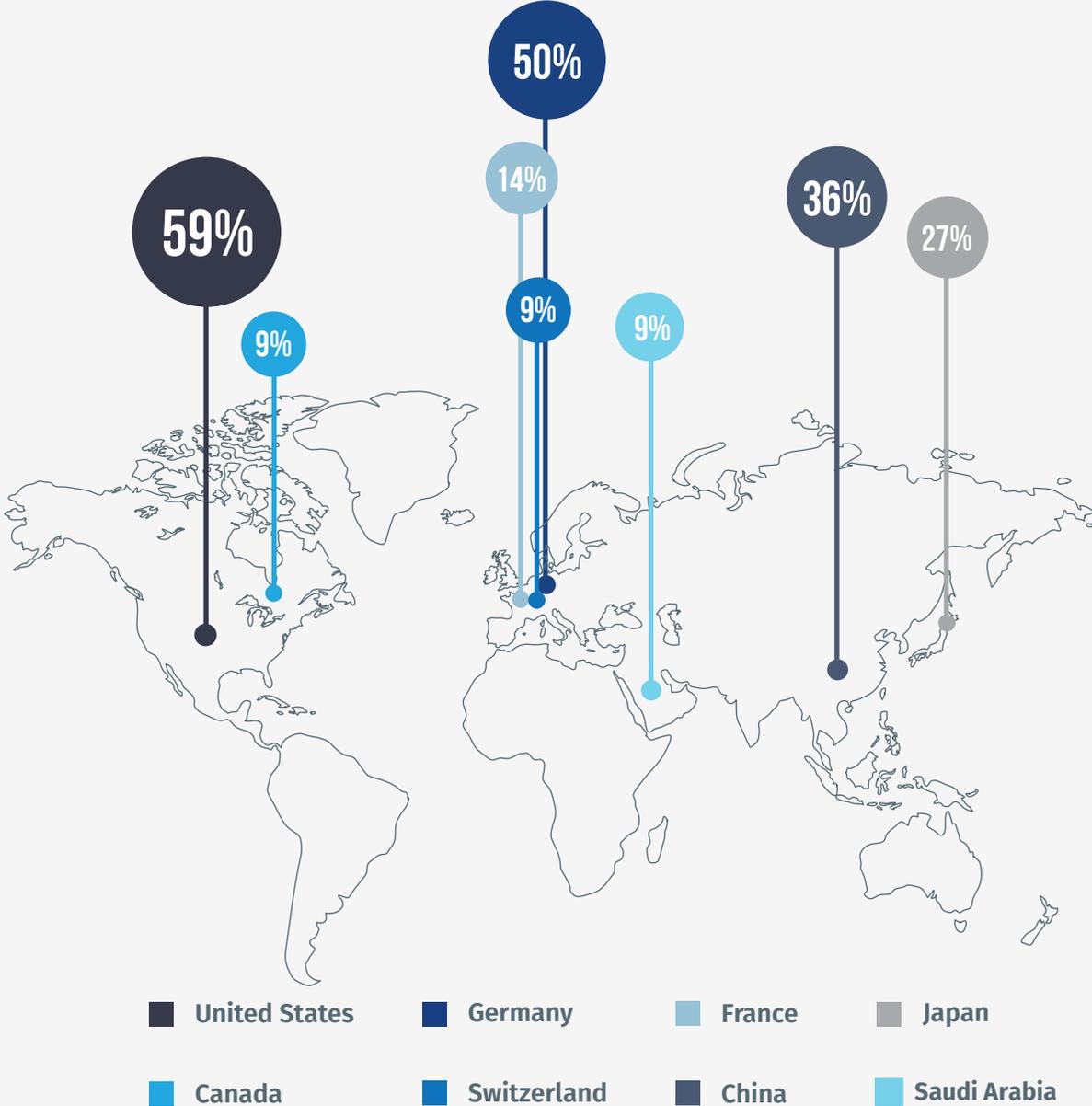
i 97% OF OUTPUT EXPORTED OUTSIDE OF SCOTLAND



Scotland's strength in photonics exports provides excellent opportunities for growth, with a global market increasing at twice the rate of global GDP and estimated to reach £800bn by 2025¹. This opportunity must be recognised when considering Scotland's future export strategies and internationalisation efforts.

OPPORTUNITY

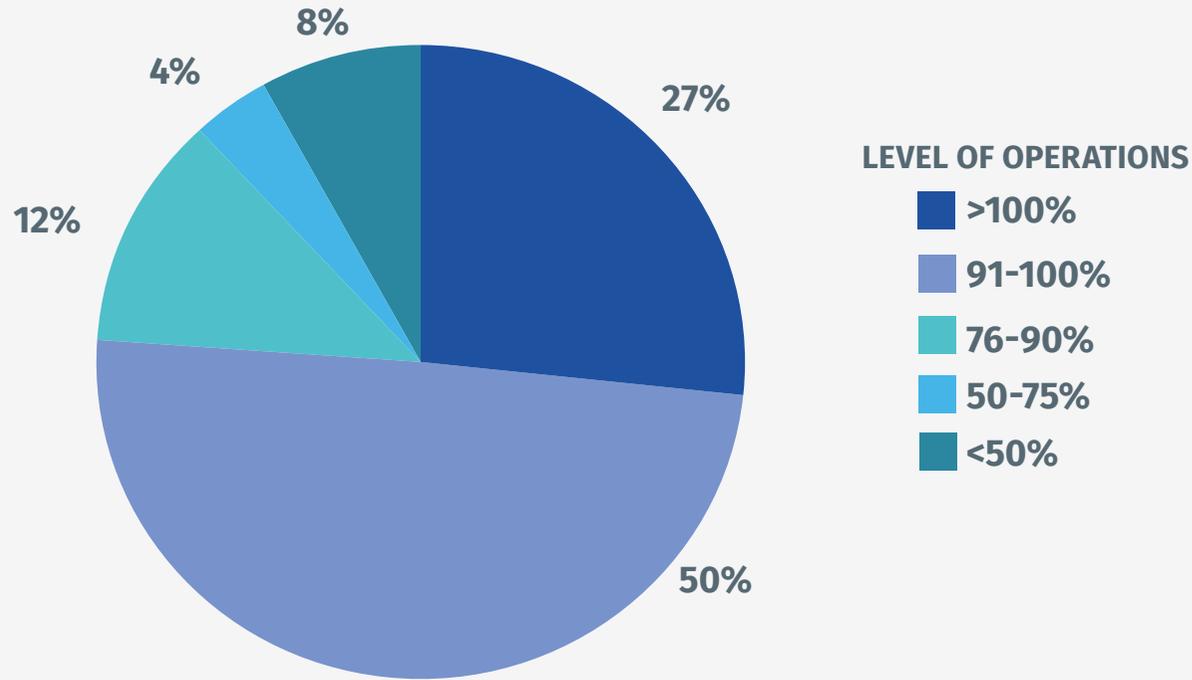
TOP EXPORT MARKETS



■ United States ■ Germany ■ France ■ Japan
 ■ Canada ■ Switzerland ■ China ■ Saudi Arabia

Impact of COVID-19

LEVEL OF OPERATIONS POST MARCH 2021 COMPARED TO PRE COVID-19



Scotland's photonics sector has been extremely resilient in the face of the unprecedented COVID-19 pandemic, with 77% of companies maintaining at least 90% operational capacity throughout the pandemic.

OPPORTUNITY

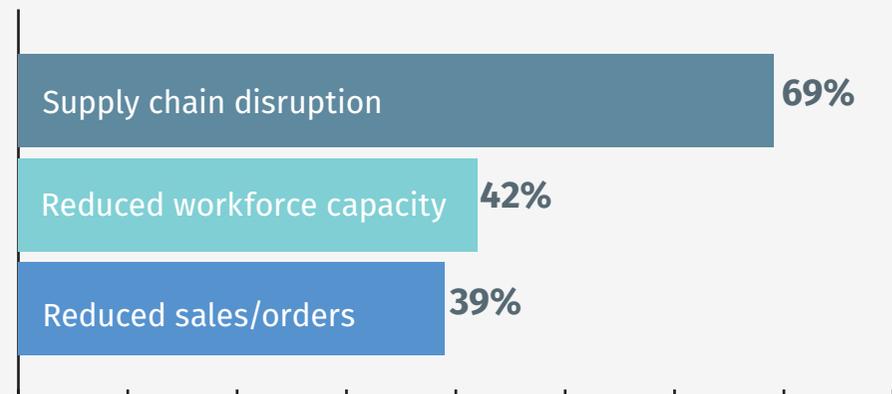
46%

organisations have made use of UK Government or Scottish Government COVID-19 support schemes



75% of the companies that did make use of government support accessed the government job retention scheme

ANTICIPATED POTENTIAL ONGOING IMPACTS OF COVID-19

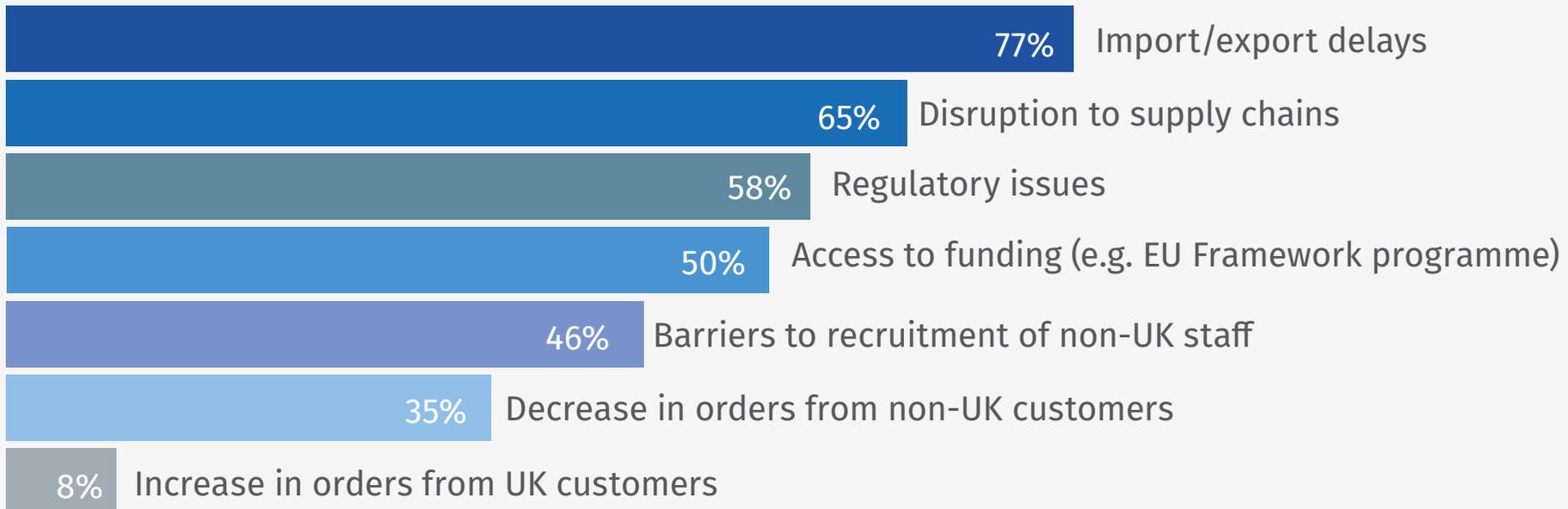


Impact of Brexit

IMPACT ON BUSINESS

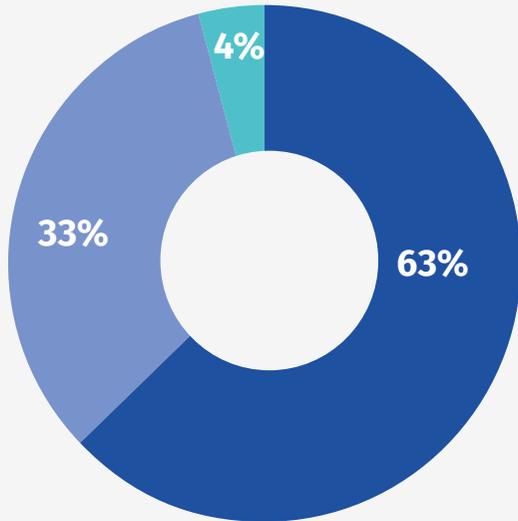


ANTICIPATED CONTINUING IMPACTS OF BREXIT



Growth

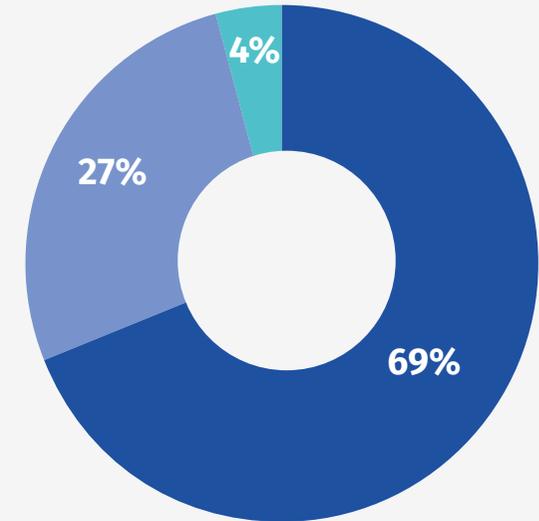
TURNOVER COMPARED TO PREVIOUS YEAR



96%

of companies project further growth in turnover and employee numbers over the next 12 months

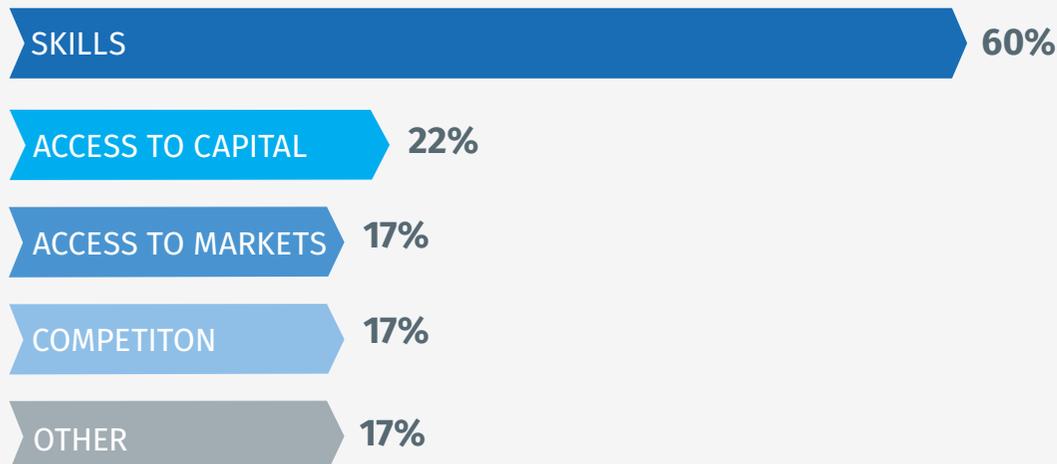
STAFF NUMBERS COMPARED TO PREVIOUS YEAR



Greater The same Smaller

Greater The same Smaller

BIGGEST IMPEDIMENT TO GROWTH



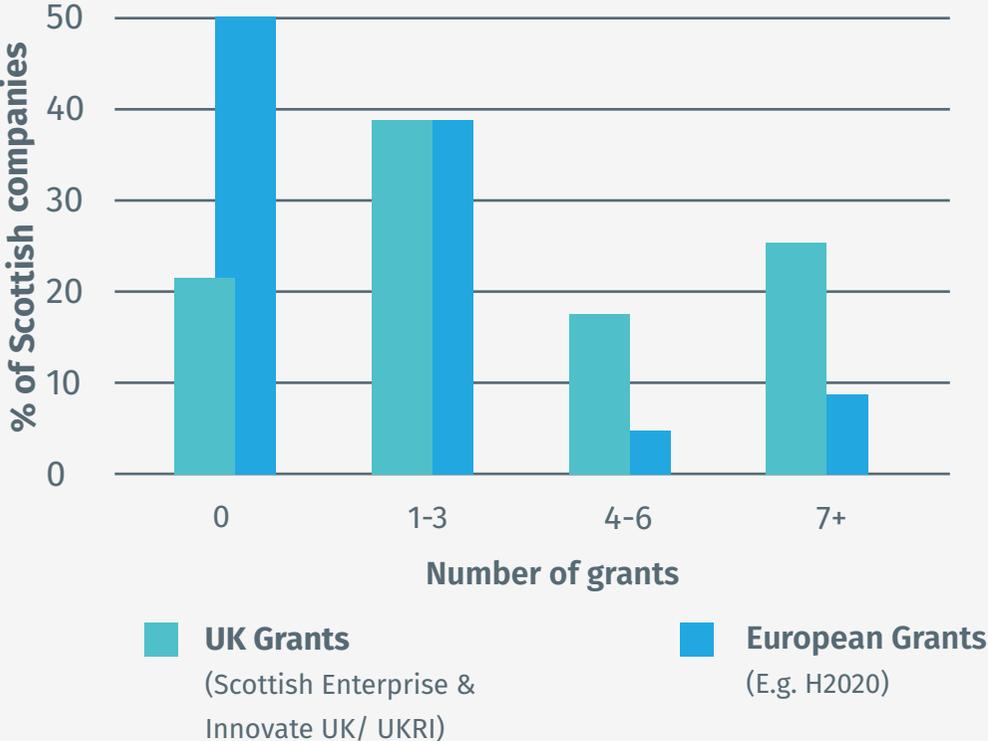
Access to skills remains the biggest impediment to the growth for the sector. There must be an increased focus on upskilling the existing workforce and accelerating entry of new talent from adjacent sectors and our education pipeline.

OPPORTUNITY

Innovation and research


65% of companies have made use of a UK innovation asset in the last 3 years.

Grants applied for in the past 3 years





It is very encouraging to see a high success rate for the sector in both domestic and European funding, however there is potential for increased involvement in the European Framework Programme. Guidance and support need to be provided to the sector to increase the number of organisations participating in these collaborative research opportunities.

OPPORTUNITY

UK Grants



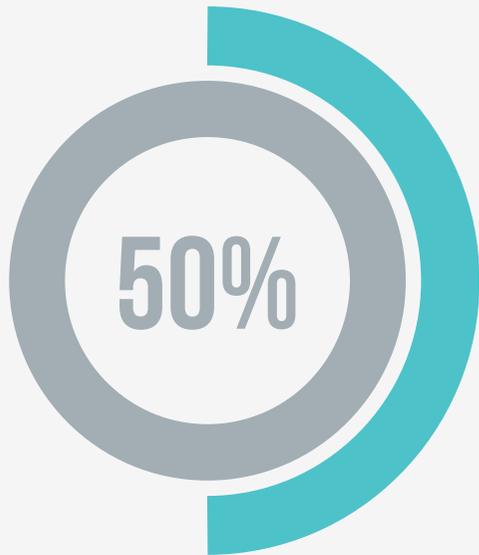
European Grants



Towards net zero

62%

of organisations have formal commitments to reduce their environmental impact over the next 5 years



Of organisations develop/manufacture products or services that could **contribute directly or indirectly** to the Scottish Government's commitment to reach net zero by 2045.



As a key enabling technology, photonics underpins solutions for numerous applications that can significantly contribute to sustainability, and support Scotland's vision for net zero and goal of a just transition. The photonics sector in Scotland stands to support this goal, providing innovative solutions that will benefit people both locally and globally. In doing so, it will continue to make a valuable contribution to the Scottish economy, supporting a growing number of high value, sustainable manufacturing and research jobs.

OPPORTUNITY

Community comments

WHAT ONE THING SHOULD THE GOVERNMENT AND ITS ENTERPRISE AGENCIES PRIORITISE TO SUPPORT SCOTTISH PHOTONICS?

"Consistent, enduring, support for skills, and support infrastructure mechanisms, like Photonics Scotland."

"Skills development."

"Increase the quantity and expertise of the skills pipeline from technicians to leading researchers and engineers."

"Continue support grants and funding for R&D projects."

"Build up an indigenous capability in optical fibres, to support everything from next gen optical comms, to industrial processing, to defence."

"Better access to investment."

"An equal balance between fundamental and applied research."

"More community building and access to funding for small collaborative projects to get Scottish companies working together towards innovative new products or supply chains."

"Capital financing, more support for trade outreach."

"Support non-university start-ups and small companies to access capital and skills shortages."

"Cooperate with the UK government to reduce trade barriers and focus on recovery rather than another independence referendum. Trade barriers with our biggest trading partner (England) would be a disaster. The uncertainty created by independence discussions are weakening our growth prospects and making investment difficult."

"More funding to support growth."

"Support a balanced portfolio of R&D in the university system that includes industrial-needs."

"The Government can play a significant role in championing new and emerging sectors, helping to stimulate the later stage developments that will be necessary for key areas such as quantum technologies to reach maturity."

"Encourage Applied Physics and Engineering degrees."

"Routes to access capital via loans or grants."

"R&D funding opportunities that match business-funding rules of EU Horizon 2020 'Research and Innovation Activities' instrument: 100% direct cost funded + overheads rather than the low 25-35% funding levels by Scottish Enterprise or 50% by Innovate UK."

"Encourage more University Researchers to Start SMEs Our Enterprise Agency is very pro-active."

"Encourage University Contract Departments to be more flexible in Industrial Collaborations."