National Centre for Universities and Business

UCI University Commercialisation & Innovation *Policy Evidence Unit*

INNOVATING DURING A CRISIS

THE EFFECTS OF THE COVID-19 PANDEMIC ON HOW UNIVERSITIES CONTRIBUTE TO INNOVATION

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FOREWORD

David Sweeney
Executive Chair of
Research England

The Covid-19 pandemic has impacted almost every aspect of our lives. UKRI, like so many other organisations, had to respond rapidly to understand its consequences for UK research and innovation.

Across the UK and around the world, universities, businesses and others rallied to drive life-changing and life-saving innovations. The development of a Covid-19 vaccine built on decades of fundamental research, was invented and developed at an astounding speed by the University of Oxford and AstraZeneca.

Whilst some parts of the research and innovation system have stood in the spotlight during this crisis, many institutions across the regions and nations of the UK have been directly impacted by its consequences. Critical to forging the road ahead is understanding the immediate consequences of the pandemic. I am therefore grateful to the new Policy Evidence Unit for University Commercialisation and Innovation (UCI) at the University of Cambridge and the National Centre for Universities and Business (NCUB) for collecting the critical evidence contained in this report.

The findings help define the nature and scale of the problem, offering insights into how Covid-19 has impacted universities' innovation-focused activities and partnerships, as well as which industry sectors and parts of the university system are most affected. Importantly, this helps us to also develop answers. So that we are offering the right support to help, at the right time.

This is not just important for UKRI, universities, and research-active businesses. I truly believe it is critical for our long-term national recovery.

As we plan towards a review of our Higher Education Innovation Funding (HEIF), the insights gained from this report will help us to see the plans of each individual higher education provider in the context of the sector as a whole, and to identify and feedback key themes and directions of travel, challenges and opportunities, thereby improving efficiency and effectiveness overall.

I am extremely grateful to Tomas Coates Ulrichsen of the University Commercialisation and Innovation Policy Evidence Unit as well as the NCUB for producing this report and the many colleagues in universities who contributed by taking the time to fill in the survey. I do hope you will join me in welcoming the insights gained from this important evidence and I look forward to working with colleagues to discuss ways forward.

EXECUTIVE SUMMARY

This report investigates the effects of the COVID-19 pandemic on the ability of universities to contribute to innovation through the crisis and into the economic recovery. A parallel report – Innovation and Resilience in a crisis: The impact of Covid-19 on UK business R&D – led by the National Centre for Universities and Business, looks at the effects on business R&D and innovation.

The COVID-19 pandemic has had profound and devastating effects on societies and economies around the world. The response to the health crisis highlighted the critical importance of productive and effective partnerships between companies, universities, research institutes, public sector agencies, hospitals, charities and others in developing innovative solutions to very urgent problems. Looking forward, such innovation-driven partnerships must be at the heart of approaches to driving economic recoveries and renewal from the pandemic at the global, national and local level.

A strong and resilient system of universities, research institutes and technology development organisations, working in close partnership with the private and public sectors will be crucial to driving an innovation-led economic recovery. However, while there is increasing evidence that the pandemic has caused significant disruption to business R&D and innovation activities, we know much less about how it is affecting universities and their ability to contribute to innovation through the crisis.

In this report we explore this issue in depth. We draw on the responses of sixty-one senior UK university leaders with responsibilities for their knowledge exchange, innovation and commercialisation to a survey distributed in August/September 2020.

We investigate in particular how the pandemic has affected:

- **The level of innovation-focused activities** between universities and different types of partners and with different sectors
- **The availability of funding** to resource and support these activities
- **The main challenges faced** in initiating and delivering projects
- **New ways of working** developed during the pandemic that universities would like to see sustained
- **Expectations for the future** to March 2021 on changes to the levels of activity and funding
- **The roles of universities** in driving innovation may change as the UK confronts the economic recovery
- **Actions governments can take** to enable universities to play an active and strategic role in the economic recovery and renewal following the pandemic

The survey responses were collected during August/September 2020. Due to a lack of response from specialist arts universities to the survey, we had to exclude this type of institution from our analysis and discussion. The report refers to the period between March and July 2020 as the 'lockdown' period.

Universities and innovation pre-COVID-19

Pathways to innovation impacts

The report reveals the significant breadth of ways through which universities contribute both to the innovation process as well as to the development of the system that enables innovation to happen. Contributions are made not just through the different types of basic, use-inspired and applied R&D, but also through support provided to partners for identifying new opportunities and at the later stages of the innovation process. Many universities are seeing a wide range of activities aimed at strengthening the innovation system to better enable the development, diffusion and deployment in practice of new technologies and ideas, not least by providing leadership, advice and intelligence to support the strategic development of places and sectors, developing skills within the system, and in helping to build an entrepreneurial and innovation culture.

Figure X.1 **Highest ranking key sectors identified by universities in each KEF cluster (percentage of university responses in cluster)**

Key sectors for universities' innovation-focused activities

Universities contribute to innovation across a wide range of manufacturing and services industries. There is some evidence of specialisation within the university system in terms of the sectors with which they have most significant links. The large research intensive universities of the KEF cluster V are more likely to identify pharmaceutical manufacturing and medical biotechnology, aerospace manufacturing, and the manufacture of electronic & electrical components and instruments, as key sectors. By comparison smaller teaching-led and less research intensive universities of KEF Cluster JM identified sectors such as human health and social work, computer programming and related ICT, agriculture and fishing, and the creative industries as key sectors.

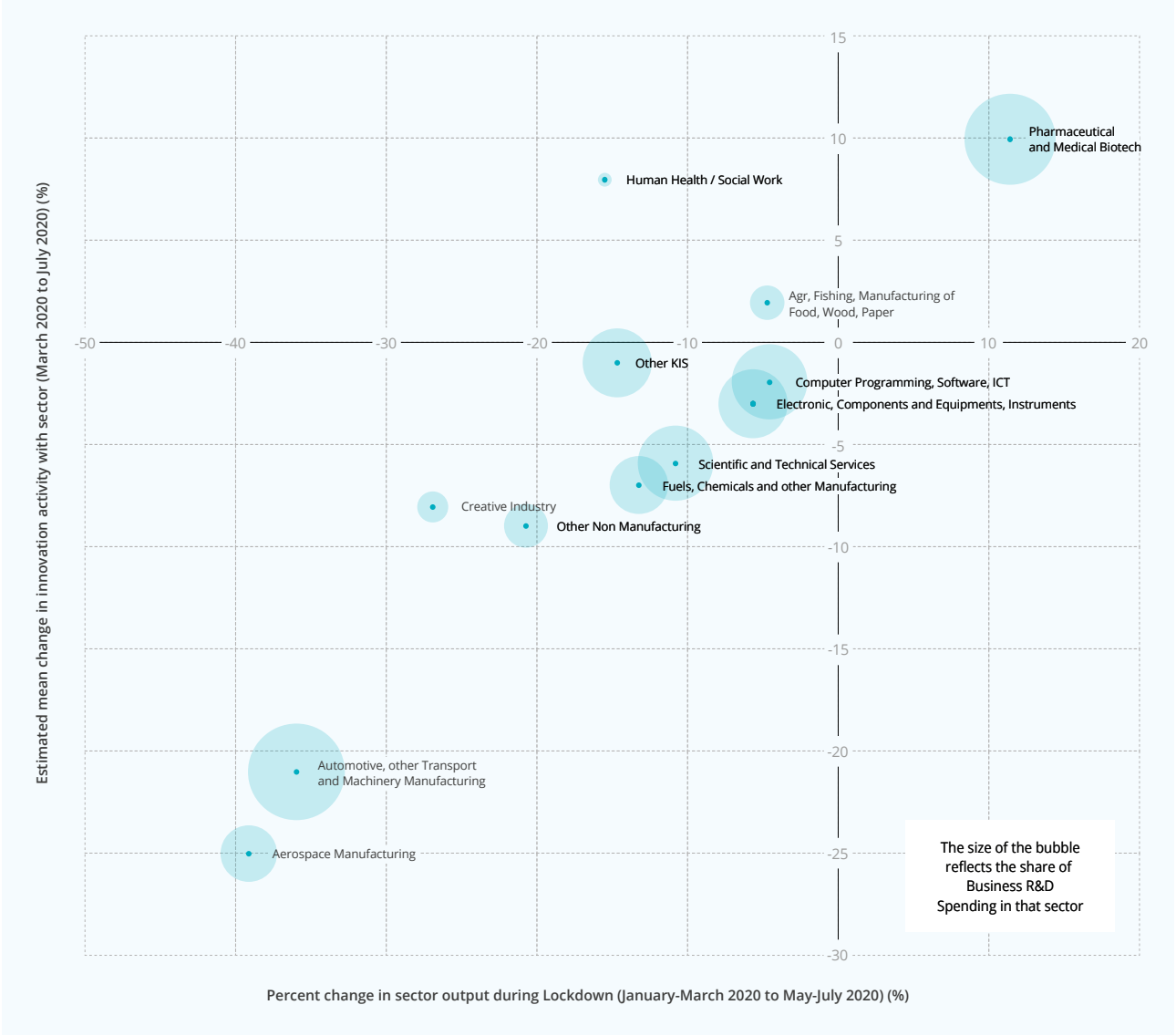
The effect of the Covid-19 pandemic on universities' innovation activities

Level of activity with key sectors

There is a clear correlation between the scale of change in the economic output of individual sectors and the change in the levels of innovation-focused activities with universities. The biggest declines in activities with universities were observed in sectors such as aerospace and automotive manufacturing, the creative industries and media, and with non-biotechnology scientific and technical services. By contrast, on average activities increased with strategic partners, and with pharmaceutical manufacturing and medical biotechnology sector, with agriculture, fishing and forestry, and with human health and social work).

Figure X.2

Relationship between change in the sector output during Lockdown and the change in level of innovation activity between universities and partners in the sector

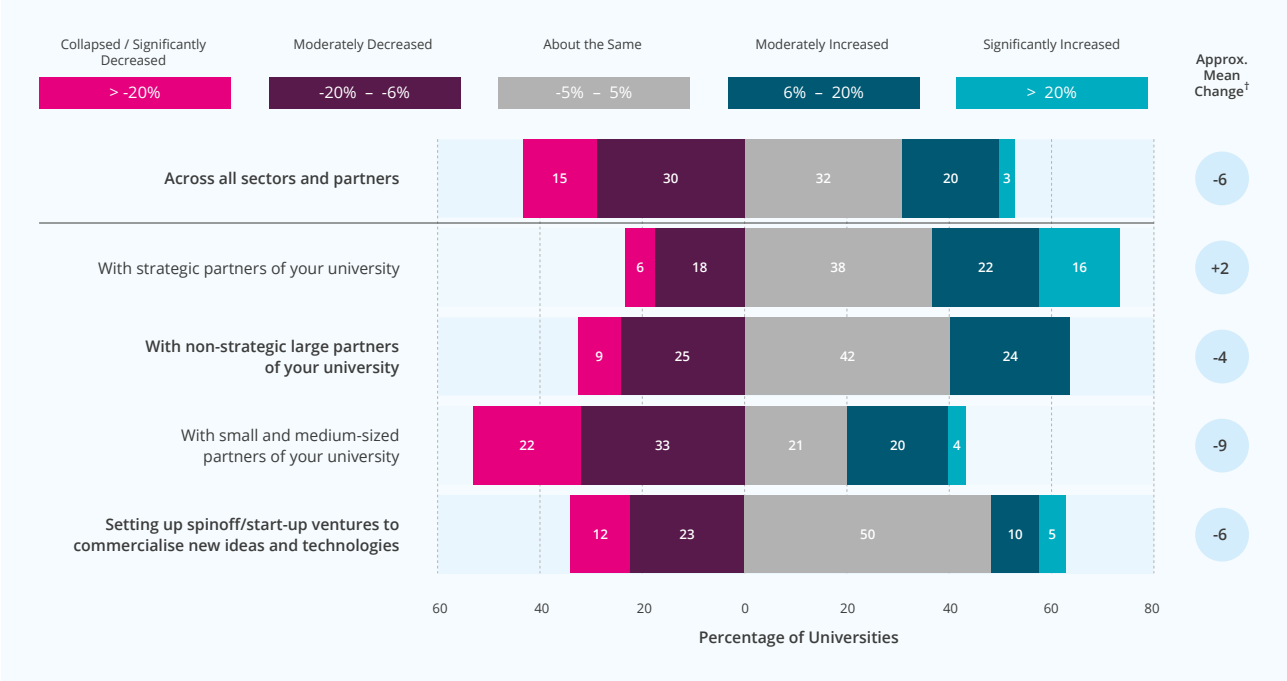


Notes: (i) change in sector output for other knowledge intensive services (Other_KIS) excludes financial and insurance services; (ii) mean change estimated by taking the following category points: Collapsed (-51%); Significantly decreased (-35%); Moderately decreased (-13%); About the same (0%); Moderately increased (13%); Significantly increased (21%).

Sources: ONS Index of Production September 2020, ONS Index of Services September 2020, ONS Output in the construction industry September 2020, ONS GDP first quarterly estimate time series (PN2), UCI/NCUB survey of universities.

Figure X.3

Change in the level of innovation-focused activities with different types of partners during Lockdown



†: Mean change estimated by taking the following points in each category: Collapsed (-51%); significantly decreased (-35%); moderately decreased (-13%); about the same (0%); moderately increased (13%); significantly increased (21%).

Level of activity with different types of partners

There is also evidence that many universities' innovation-focused activities with SMEs have been badly affected by the pandemic.

The results do highlight the value of building long term strategic partnerships with firms and others. Activities with these types of partners were much less affected and in many cases actually increased during the pandemic. These partners were also more likely to invest time and effort in maintaining relationships while funding may be depressed.

Nature of changes to projects

During Lockdown universities were more likely to have experienced delays and postponements of work, and attempts at renegotiating terms and conditions, rather than outright cancellations of projects. It raises important questions of how long the reduced or postponed activities can be sustained if the finances of partners do not improve.

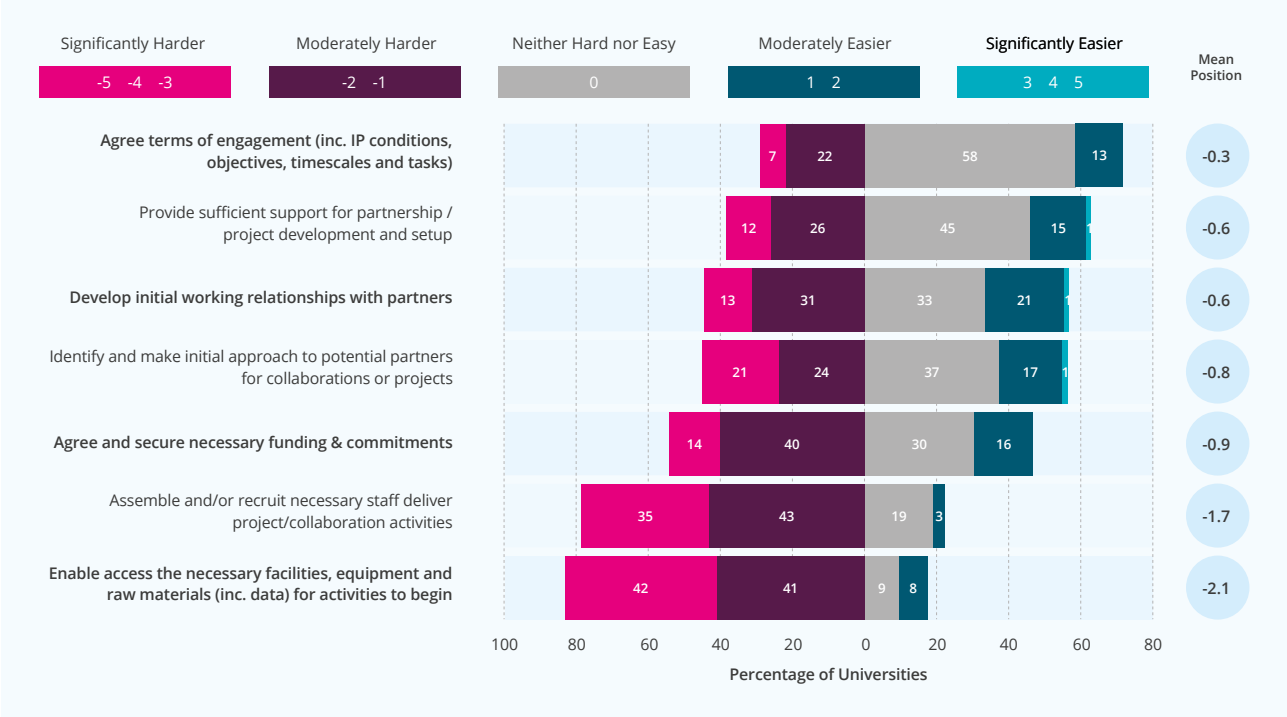
Challenges for initiating and delivering activities

The main challenges facing universities in delivering existing projects and in initiating new partnerships centre on their ability to ensure access to necessary facilities, equipment and raw materials (including data), and the ability of staff to dedicate sufficient time to project tasks. Covering financial costs of existing activities, and securing funding for new projects were also frequently cited as a key challenge.

Availability of funding

While public funding for R&D, innovation and commercialisation projects – COVID and non-COVID-related was largely unaffected, or even increased, during Lockdown, funding availability from industry and charitable sources for non-COVID-related projects decreased for many. Further, many universities reported a decreased availability of funding for providing the services and support to initiate and deliver non-COVID-related projects, and for building capabilities of staff to lead and deliver such projects.

Figure X.4 **Ability to initiate new innovation-focused projects or collaborations with external partners**



Innovative processes, behaviours and approaches developed during lockdown

New ways of working

Universities responded to the challenges of Lockdown by developing new ways of working and engaging with partners to support their innovation activities and objectives. Those responding to the survey wanted to see a number of these new processes, behaviours and approaches sustained beyond the pandemic.

In particular developments were believed to have resulted in:

+ **Improved efficiency & effectiveness** through moving certain types of activities online, finding new ways of working, building stronger digital and collaboration capabilities, and improving the speed and flexibility of negotiations

+ **New opportunities for productive and valuable interactions** and partnerships beyond the immediate projects to address COVID-19 challenges. For example, moving certain activities online opened up new opportunities and access to a broader range of partners; some of the technologies, processes and approaches developed as part of the COVID response are now finding applications elsewhere; and longer term opportunities for valuable engagement are now emerging from the partnerships formed with the local health system, businesses and the community as part of the COVID-response

+ **Improved use of funding**, for example through reduced bureaucracy and grant administration requirements during the pandemic; increased flexibility in how grants could be used; the ability to pool funding to deliver more impact- and challenge-focused projects; and changes to funding terms around industry match requirements making it easier for partners to engage despite significant financial pressures.

Expected changes over the short term to March 2021

Expected change in the levels of activities

As universities looked to the future in September 2020 they, on average, expect to see a moderate bounce back in the level of innovation-focused activities with external partners, although not enough to make up for the decreases experienced during the Lockdown. Overall, just a third of the universities responding to the survey expect to see levels of innovation-focused activities higher in March 2021 than pre-pandemic. Activities with strategic partners look much more positive with universities, on average, expected to see growth in the level of activities accelerating as we transition from the immediate health crisis into the economic recovery.

Expected change in funding availability

While many universities expect to see some degree of bounce back in the level of innovation-focused activities with external partners, there are concerns about whether the level of funding available to fund projects and support will do so. As we move into the early phase of the economic recovery, universities expect the level of available funding for COVID-related projects to grow less rapidly than during the initial phase of the pandemic. Further, they expect to see little change in the levels of public funding for non-COVID-related projects and continued, significant decreases in industry and charitable funding. These trends raise important questions about whether and how universities will be able to play a full and active role in the economic recovery and renewal phase.

The role of universities in the economic recovery

Maintaining core R&D capabilities, increasing challenge-driven programmes

As the political, social, economic and industrial landscapes shift dramatically as a result of the pandemic, universities are having to reflect on how they can best contribute to the economic recovery and renewal of a nation, of key sectors, and of their local economies and communities. The survey suggests that only small shifts in the balance of different types of R&D, likely reflecting universities' core long-term competences that underpin their long-term impacts. One key development is the expected growth in importance of challenge-driven programmes that integrate not just research but also its translation into applications.

Strengthening contributions to support wider innovation processes of partners

Much bigger changes are expected in the innovation-services and support universities provide beyond R&D. In particular, universities expect to place greater importance on supporting partners in later stages of innovation process (e.g. prototyping and technology demonstration) and in helping them to identify and adopt new technologies, processes and systems to drive efficiency and productivity improvements.

Strengthening contributions to develop the enabling system of innovation

Many university leaders also expected the importance of a wide range of services and support to strengthen the underlying system which enables innovation to take place to increase during the economic recovery. This includes the provision of leadership and intelligence to support strategic development of places and sectors, and work to build skills within the system to drive the generation and adoption of innovations, and efforts to strengthen innovation and entrepreneurial culture and capabilities.

Government support during the pandemic and beyond

Government schemes have helped universities continue to contribute to innovation through the crisis

A number of UK Government schemes were introduced or amended to variously support firms, universities and the collaborations that form between them. All programmes explored in this study had a positive effect on the ability of universities to continue to initiate, support and deliver innovation-focused activities with partners. Perhaps unsurprisingly, universities viewed those funding programmes that directly supported the functioning of the university-innovation interface and the active translation and commercialisation of research as having the greatest positive effects.

More needs to be done to enable universities to contribute fully to economic renewal

The universities responding to the survey also identified a number of government actions that could help to enable the university system in the UK to contribute fully and strategically to economic recovery and renewal.

More funding for core knowledge exchange services, translation and commercialisation, and challenge & outcome driven programmes

Many called for more funding in a number of areas. In particular to support:

- The enabling system of knowledge exchange infrastructure and support
- Post-research translation, development and commercialisation activities that helps ideas and technologies progress along the research-to-innovation pathway towards application
- Delivery of challenge-and outcome-driven programmes
- The building of international collaborations and links, which will become even more important as the UK transitions out of the European Union

Supporting place-making

Universities also emphasised the importance of the place-making roles of their institutions in tackling place-specific challenges and opening up new opportunities for wealth creation. However, this needs to be adequately resourced and supported by government. Related to this are calls for the UK Government to maintain their focus on 'levelling-up' and make tangible steps to deliver on this agenda.

Targeted support for place and sector recovery from Covid

Many places and sectors will suffer long-lasting damage as a result of the pandemic. The effects will inevitably be unevenly spread across the UK and its industries. There were calls for the UK Government to work closely with universities and other key stakeholders in national, sectoral and local innovation systems to develop targeted and funded interventions to help those places and sectors badly affected by the pandemic to recover, adapt and renew post-crisis.

Improve flexibility, bureaucracy and terms of funding

There were also calls for efforts to improve the flexibility, bureaucracy and terms of funding programmes to make it easier to develop effective funding proposals, invest coherently along the research-to-innovation pathway to ensure pull-through and translation of ideas into impacts, and attract the necessary partners. Related to this, as more challenge-driven programmes emerge more efforts need to be made in ensuring effective integration and coordination of funding programmes from different funding agencies and departments.

Ensure metrics capture diversity of contributions and reward diversity of universities

The suitability of key metrics that drive funding allocations and measures of success was also raised. Here there were calls to ensure that the full breadth of economic and social outcomes – many of them hard to quantify let alone monetise – are captured, and that funders recognise and value the UK's diverse university system in delivering impacts at different scales (globally, nationally and locally).

Ensure long-term sustainability of the university system and its ability to contribute to innovation and economic development

Lastly, the pandemic has created significantly intensified financial pressures on universities. With the sustainability of university research already under pressure pre-pandemic, moving forward it is important that universities and government funders have a realistic and robust discussion about the full costs of universities working simultaneously to deliver key government priorities including not least raising R&D and innovation in the economy, contributing to levelling-up, and supporting industries, economies and communities in recovering from the effects of the pandemic and adapting to the new socio-economic and industrial landscapes.

01 INTRODUCTION

The COVID-19 pandemic has had profound and devastating effects on societies and economies around the world. In the UK it has led to the largest decline in economic output in 300 years (Office for Budget Responsibility, 2020). It adds to the growing list of time-critical global, national and local challenges that the UK has to address, including not least the climate crisis, the effects of ageing populations, persistent global economic and social inequalities, more than a decade of stagnant productivity growth, many towns and cities 'left behind' from the increases in overall economic prosperity of the past few decades, and of course, Brexit.

Innovation will be at the heart of approaches to economic recovery and reinvention from COVID-19 as well as critical for finding solutions to the many other urgent challenges we face as a nation. While the private sector is often seen as the driver of innovation, many other organisations – not least universities and research institutes – have become increasingly important and strategic partners in the process, contributing to a wide variety of knowledge and technological advances, as well as different types of resources, capabilities and infrastructure. Creating and capturing value through innovation requires a healthy and vibrant system of innovation involving both the private and public sectors and both competition and collaboration.

Evidence is now emerging about the effects of the COVID-19 pandemic has had on the R&D and innovation in businesses (Am et al., 2020; Bank of England, 2020; NCUB and UCI Policy Evidence Unit, 2021; Roper and Vorley, 2020). However, much less is known about how it is affecting universities and in particular their ability to contribute to innovation through the crisis and into the economic recovery. This report addresses this gap in our understanding.

The report presents the findings of a survey of senior leaders and managers of UK universities on a variety of topics relating to how the pandemic has affected their institution's ability to continue to engage in innovation-focused activities and partnerships through the crisis. It also explores expectations of how the situation might change in the short term to March 2021 and whether the roles and priorities of universities might shift as we move from crisis into economic recovery and renewal. The focus of our study is on those activities of academics and universities, beyond their core research and education roles, aimed at contributing directly to the innovation process or the strengthening of the underlying conditions enabling innovation to take place.

The survey was developed by the University Commercialisation and Innovation (UCI) Policy Evidence Unit at the University of Cambridge and the UK's National Centre for Universities and Business (NCUB). The survey was conducted in August/September 2020. A parallel study, Innovation and Resilience in a crisis: The impact of Covid-19 on UK business R&D, led by NCUB with support from the UCI Policy Evidence Unit, explored the effects of the pandemic on business R&D.

02 UNIVERSITIES, INNOVATION AND THE COVID-19 PANDEMIC

2.1 Universities as partners in the innovation process

Universities play an increasingly important and strategic role in the innovation system and process (Deiaco et al., 2012; Youtie and Shapira, 2008). Through their basic, use-inspired and applied research, and their varied knowledge exchange activities they generate and diffuse new ideas, technologies and approaches that not only have the potential to lead to ground-breaking innovations that transform the world but also help to deliver important incremental innovations that help to drive efficiency and productivity improvements (Cohen et al., 2002; Hughes and Kitson, 2014; Lee, 2000).

Through their research, universities also contribute to innovation well beyond driving technological advances. For example research helps to drive: new business models and organisational practices to create and capture value; new ways of producing and supplying products and services in more efficient and sustainable ways; insights on how individuals and populations behave, respond and adapt to new technologies; and public policies, standards and regulations, and ethics frameworks that guide the development and diffusion of innovations (Hughes and Kitson, 2014; Jacobsson and Vico, 2010).

Universities also leverage their expertise and infrastructure to support their partners in delivering their innovation activities. For example, they can help to understand the need for innovations and identify new opportunities. They provide services to support partners in developing, demonstrating and testing new technologies, processes and products/services, and on how to take their innovations to market (Bercovitz and Feldman, 2007; Betz, 1997; Lee, 2000; Lester, 2005). Further, universities actively engage to provide technical assistance to partners to help solve specific problems and in adopting the latest innovations to drive efficiency and productivity gains (Hughes et al., 2016; Lester, 2005; Youtie and Shapira, 2008).

Universities are known to play an important role in strengthening the wider capabilities and infrastructure of the innovation system that shapes the ability of organisations to collaborate and innovate, and for innovations to be introduced and diffused (Breznitz and Feldman, 2012; Gunasekara, 2006; Hugshes and Kitson, 2012; Lester, 2005; Uyarra, 2010; Youtie and Shapira, 2008). Examples include:

- **Helping to build the necessary technical and managerial skills to innovate**
- **Investing in physical infrastructure** that supports experimentation with new innovative ideas and very early stage company growth
- **Helping to build research and innovation networks**
- **Facilitating knowledge spillovers** that stimulate innovation in proximity to the university
- **Providing strategic insights and intelligence** to inform regional and national sector and technology strategies
- **Working alongside key stakeholders** to provide regional leadership
- **Helping to raise the public understanding** around the potential opportunities and societal implications surrounding new technologies and innovations (e.g. big data and artificial intelligence driven services)

Figure 1 **Understanding how universities contribute to innovation**

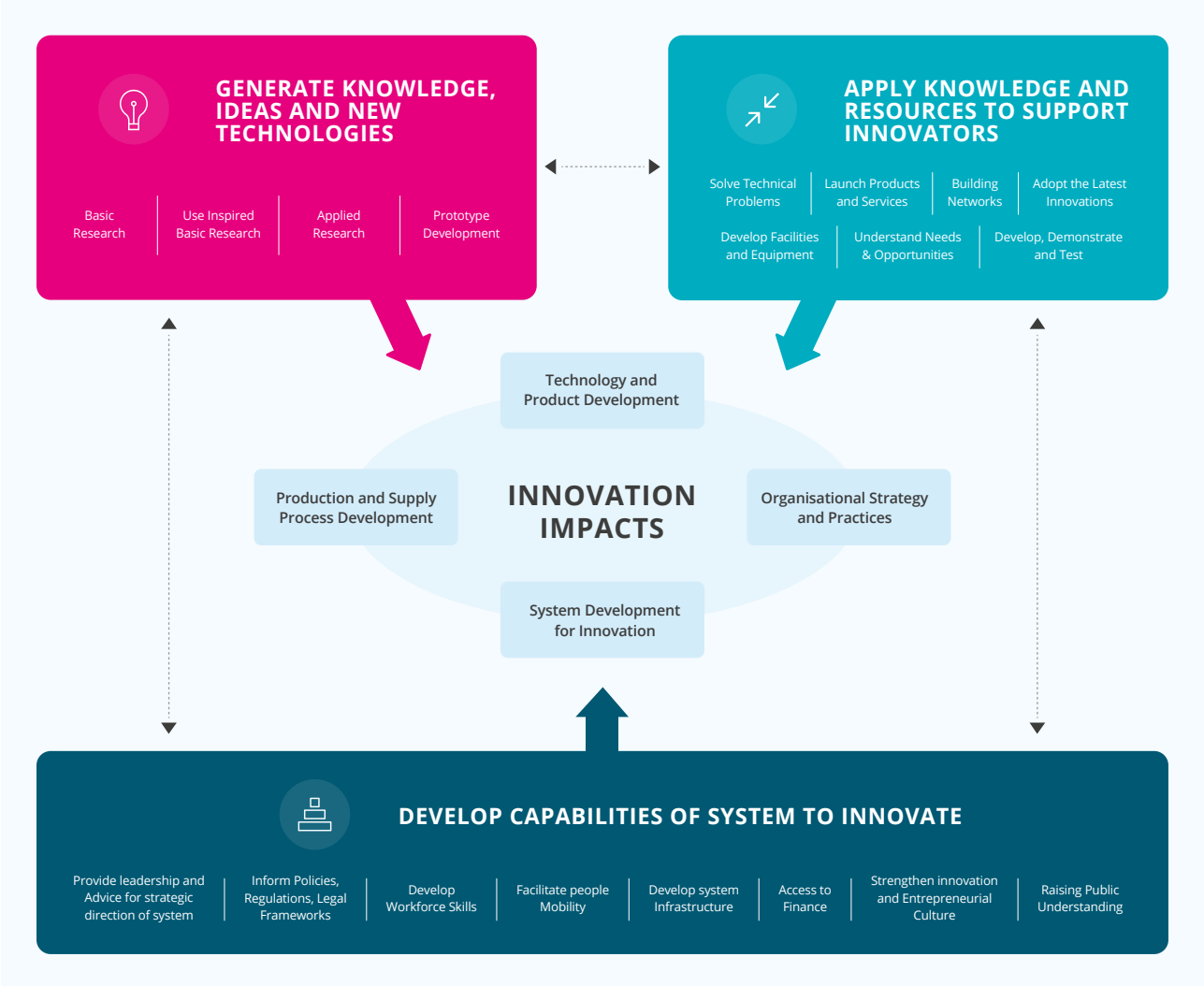


Figure 1 attempts to bring together the many and diverse ways through which universities are known to contribute to innovations of different types. It highlights different types of innovations: new technologies and products; ways of producing and supplying them; organisational strategies and practices; and the development of the system that underpins the ability of innovators. It then distinguishes three broad types of universities contributions: (i) generating new knowledge, ideas and technologies that form the basis of new innovations; (ii) applying their existing knowledge base and resources (such as their physical infrastructure and social networks) to support innovators in delivering their innovation activities; and (iii) developing and strengthening the capabilities of the system to better enable organisations to innovate and for innovations to be introduced and diffused. Crucially it is important to recognise that many disciplines – including not just science, technology, engineering and mathematics, but also the social sciences and arts and humanities – play an active role in enabling these contributions.

However, we must recognise that the technologies and ideas emerging from universities typically require much further development and investment by other organisations in the innovation system to translate them into practical applications operating in the real world. This often involves private sector firms and investors, although depending on the innovation may include active involvement by public sector agencies and government departments (e.g. through public investments in technology development or through procurement), standards and regulatory agencies, user communities and others. Thus the actual impacts realised from university knowledge is highly dependent on the resources, capabilities, and willingness to invest of organisations well beyond the university itself.

2.2 Examples of university responses to the COVID-19 pandemic

The pandemic has revealed many examples of how universities have contributed in significant ways to innovation to address not just the immediate health crisis but also to support their local economies and communities. It was particularly striking how quickly universities and universities and research institutes, research and technology organisations, businesses and their supply chains, public health authorities, hospitals, regulators and others, reconfigured their resources and capabilities and came together to rapidly develop practical solutions to time-critical problems.

“

The pandemic has revealed many examples of how universities have contributed in significant ways to innovation to address not just the immediate health crisis but also to support their local economies and communities.

For example university researchers, working closely with these types of partners have driven an unbelievably fast vaccine development process and setup a nationwide therapeutic clinical trial; developed rapid diagnostic tools, an app designed to study symptoms in detail; early detection and warning systems, and applied innovative genome technologies to map the spread of the disease; designed sharable ventilators, non-invasive breathing aids and affordable high quality ventilators for low-income countries; and provided insights to support public policymaking. At the same time, universities have been active in their support of local communities and businesses, whether it has been in the manufacture and distribution of PPE (e.g. by the universities of Sheffield, Bangor, Falmouth, and Cambridge), informing the local health response, or in helping smaller firms to navigate the economic crisis (e.g. by the universities of Cambridge, Cranfield and Lancaster).

However, while there are now a wealth of examples of how universities, through partnerships and engagements with private, public and third sector organisations and investors, rapidly developed solutions to a range of COVID-induced health and socio-economic challenges, we have little systematic evidence of how the pandemic is affecting their overall ability to do so, particularly in areas that are not related to the immediate health crisis.

2.3 COVID-19 pandemic and its effects on private sector R&D and innovation

There is now mounting evidence that the COVID-19 pandemic threatens the short-to-medium term functioning of private sector R&D and innovation activities; activities and investments which are crucial for enabling universities to translate and commercialise their ideas and generate realised impacts. For the UK, this comes on the back of dramatic declines in UK innovation activity since 2016 (BEIS, 2020).

With the exception of those involved in the direct COVID-19 health response, emerging evidence suggests that R&D and innovation activities and investments are being squeezed by many firms as they switch their focus to sustaining core business concerns (Am et al., 2020; Royal Academy of Engineering, 2020). Many have faced significant disruptions to their R&D operations including having to cancel, delay or reprioritise projects (NCUB and UCI Policy Evidence Unit, 2021; Roper and Vorley, 2020) and, at least in the automotive sector a likely switch towards greater in-house R&D. A recent study by Beauhurst found that firms backed by equity investments or public funding were less likely than other businesses to be negatively affected by the current crisis, and more likely to have experienced an improvement in their situations since the onset of the pandemic (Beauhurst, 2020).

Mounting evidence also suggests that disruptions to private sector R&D and innovation are also feeding through to firms' interactions with universities (NCUB and UCI Policy Evidence Unit, 2021; Roper and Vorley, 2020) with many projects being delayed or refocused, and in some cases cancelled (NCUB and UCI Policy Evidence Unit, 2021).

These trends are broadly consistent with the experiences of previous major crises such as the global financial crash of 2008 (Archibugi et al., 2013; Cincera et al., 2012; Filippetti and Archibugi, 2011; OECD, 2009; Roper, 2020). They are also particularly concerning as studies of past crises suggest that those businesses able to carry on investing in R&D – particularly in maintaining R&D human capital – through the crisis were likely to recover more quickly and emerge more competitive (Archibugi et al., 2013; Garcia Martinez et al., 2019; Roper and Turner, 2020). Archibugi et al. (2013) in particular shows that highly innovative firms pre-crisis and fast-growing new firms – those pursuing more explorative innovation strategies towards new product and market development – increased their innovation investment during the crisis and were better able to cope with its effects to thrive longer term. By contrast, small and medium sized enterprises (SMEs) and less innovative incumbent firms pre-crisis suffer much more through major crises, not least as they tend to have much less 'financial slack' that can be drawn upon in times of crisis, or access other sources of finance to sustain their R&D and innovation activities (Archibugi et al., 2013; Roper and Turner, 2020; Schmitz, 2014).

The differential effects of major crises on different types of firms can lead to longer term adjustments in the structural distribution of R&D and innovation across the economy (Archibugi et al., 2013). There are also longer-term implications for productivity and competitiveness of SMEs (Roper and Turner, 2020).

The emerging evidence of a retrenchment by firms in their external engagements in R&D and innovation is also concerning. Ahn et al. (2018) find that the increasing openness of firms provides an effective way of building resilience and survival through the crisis. In particular they find that partnering outside a firm's value chain (e.g. with universities and research institutes) and internationally, had the highest impact on the recovery of turnover post-crisis, not least by increasing the likelihood of acquiring new knowledge to unlock new opportunities for growth post-crisis.

Overall a concerning picture is emerging over the effects of the pandemic on private sector R&D and innovation which plays an important role in enabling universities to realise socio-economic impacts through innovation from their knowledge base and other assets.

03 DEFINITIONS, SURVEY METHOD AND DATA

The UCI Policy Evidence Unit and NCUB developed and distributed a survey to collect information from universities on how the COVID-19 pandemic and related economic crisis had affected their ability to engage in innovation-focused activities with external partners. It was developed in part to support the NCUB R&D Taskforce established at the request of UK Research and Innovation (UKRI) to inform the development of the UK Government's R&D Plan. It is also aimed to feed into the evidence base being assembled by Research England to inform their approaches to knowledge exchange strategy and funding[1].

3.1 Definitions

Before getting into the structure of the survey and information on targeted and realised samples, it is important to define a number of key terms used in the survey. These definitions were presented to respondents at the beginning of the survey to help standardise interpretation of the questions.

Innovation-focused activities: Activities of academics and the university, beyond core research and education, aimed at contributing directly to the innovation process or the strengthening of the underlying conditions enabling innovation to take place. Activities could include R&D partnerships, collaborations, industry sponsored research, academic entrepreneurship, technology licensing, workforce development etc.

External partners: Any type of non-academic organisation involved in the innovation process or developing the underlying conditions for innovation. Could include industry partners (large companies, SMEs, start-ups), public sector agencies, hospitals, charitable organisations etc.

Basic research: Theoretical, empirical or experimental work, undertaken primarily to acquire new knowledge about the underlying foundation of phenomena or observable facts, without any particular application or use in view.

Use-inspired basic research: Theoretical, empirical or experimental work, undertaken primarily to acquire new knowledge about the underlying foundation of phenomena or observable facts, but also inspired by considerations of use.

Applied research: original investigation undertaken in order to acquire new knowledge directed towards an individual, group or societal need or use.

Time periods

Pre-Covid: period up to March 2020
Lockdown: period between March 2020 and July 2020
Short-term: period to the end of March 2021
(Initial) Economic recovery: period to December 2021

1 https://re.ukri.org/news-opinions-events/blog/evidencing-the-effect-of-the-covid-crisis-on-universities-and-innovation-why-the-uci-ncub-survey-matters/, accessed on 09/10/20

3.2 Survey instrument

The survey instrument was developed to gather information on a number of key topics related to the effects of the pandemic on the activities of universities that enable it to contribute more actively and directly to the innovation process or the strengthening of the underlying conditions of the system that enable innovation to take place. It adopted a broad definition of innovation to include not just new or significantly improved products/services, processes, and underpinning platform technologies, but also new or significantly improved business models and organisational practices, ways of delivering and distributing products and services, and public policies and other elements of institutional framework that shapes innovation activities.

The development of the questionnaire was informed both by a literature review of how universities contribute to innovation as well as discussions with key experts on, and selected senior university practitioners involved in, developing university innovation-related activities with external partners and their experiences during the COVID-19 pandemic between March and July 2020.

Key topics explored in the survey included:

PRE-COVID PERIOD

- Key sectors into which universities had the most significant level of innovation engagements
- Importance universities placed on: (i) R&D activities to support innovation objectives of their external partners; (ii) services and support for the innovation beyond R&D; and (iii) services and support aimed at strengthening the innovation system to enable the development, diffusion and deployment of new ideas and technologies

LOCKDOWN PERIOD

- Changes in the level of innovation-focused activities with partners
- Where reductions in activity were observed, the nature of changes experienced, perceived reasons for firms seeking to reduce activity, and the extent to which partners are investing time and effort to maintain relationships through other means
- Ability of universities to ensure the necessary resources and support are available to deliver existing innovation-focused projects and activities
- Changes in the level of funding available within universities for initiating, supporting, and delivering innovation-focused partnerships, projects and activities with partners
- Ability of universities to secure and initiate new funded innovation-focused projects or collaborations with different types of partners
- Examples of innovative practices developed during Lockdown that universities would like to see sustained longer-term

LOOKING FORWARD

- Expected changes in the level of innovation-focused activities with partners over the short term to March 2021
- Expected changes in the level of funding available within universities over the short term to March 2021 for initiating, supporting, and delivering innovation-focused partnerships, projects and activities with partners
- Expected importance universities are likely to place on: (i) R&D activities to support innovation objectives of their external partners; (ii) services and support for the innovation beyond R&D; and (iii) services and support aimed at strengthening the innovation system to enable the development, diffusion and deployment of new ideas and technologies

GOVERNMENT SUPPORT

- Effects of selected UK Government schemes on universities' abilities to initiate, support and deliver innovation-focused activities through the Lockdown and into the early stages of the economic recovery
- Examples of actions the government could take to enable universities to contribute fully to driving innovation during the economic recovery

3.3 Sample

The survey was targeted at all 162 UK universities across all UK nations and regions and types of institution based on their membership in the Knowledge Exchange Framework (KEF) clusters[2],[3]. The KEF clusters were developed to identify groups of universities with broadly similar structural characteristics that are likely to affect how they engage with external partners to develop, exchange, and deploy knowledge (Ulrichsen, 2018).

The survey was distributed in early August 2020 and was open for approximately six weeks. The survey was initially distributed to senior university leaders and managers through a number of channels including the membership networks of NCUB and PraxisAuril, as well as through the Pro-Vice-Chancellor networks of key university mission groups including Universities UK, MillionPlus, Russell Group and GuildHE. Following the initial distribution, prompts were sent at regular intervals to an identified Pro-Vice-Chancellor whose remit included innovation, enterprise, knowledge exchange, business engagement or equivalent. The contact names, positions and email addresses were collected from the public websites of each university. Details of the distribution of the target sample across regions and types of institution, along with the achieved sample (responses) and response rates, are provided in Table 1 and Table 2.

Table 1 **Target survey sample: breakdown by UK region / nation**

Region / nation (aggregate)	Region / nation	Number of universities		Responses (number)	Response rate (%)
		All	Excluding specialist arts institutions		
North	North East	5	5	4	80
	North West	15	13	3	20
	Yorkshire and the Humber	12	10	5	42
North: sub-total		**32**	**28**	**12**	**38**
Midlands & South West	East Midlands	9	9	5	56
	West Midlands	12	12	3	25
	South West	15	13	4	27
Midlands & South West: sub-total		**36**	**34**	**12**	**33**
Greater South East	East of England	10	9	5	50
	London	37	26	8	22
	South East	19	17	10	53
Greater South East: sub-total		**66**	**52**	**23**	**35**
Scotland, Wales & Northern Ireland	Scotland	18	16	6	33
	Wales	8	8	4	50
	Northern Ireland	2	2	2	100
Scotland, Wales & Northern Ireland: sub-total		**28**	**26**	**12**	**43**
Total		**162**	**140**	**62**	**38**

2 KEF clusters are available at https://re.ukri.org/sector-guidance/publications/knowledge-exchange-framework-clustering-and-narrative-templates/, accessed on 12th October 2020.

3 Only English universities have been formally allocated to a KEF cluster. For the purpose of this survey, Scottish, Welsh and Northern Irish universities were allocated manually to a specific KEF cluster based on their size, research intensity, and whether or not they were a specialist institution.

Table 2 **Target survey sample: breakdown by KEF Cluster**

KEF Cluster		Number of universities	Responses (number)	Response rate (%)
V	(very large, very high research intensive universities with broad discipline portfolios including in clinical medicine, and large numbers of research postgraduates)	22	14	64
X	(large, high research intensive universities with broad discipline portfolios with limited activity in clinical medicine, and large proportion of taught postgraduates in student population)	29	19	66
E	(large universities with broad discipline portfolios across both STEM and non-STEM, generating mid-level amounts of world-leading research, and large numbers of part-time undergraduates)	32	15	47
J & M	(Small and mid-sized universities with limited funded research activity, but academic activity across STEM and non-STEM)	44	10	23
Specialists: STEM		13	3	23
Specialists: Arts		22	1	5
Total		**162**	**62**	**38**
Total (excluding arts specialists)		**140**	**61**	**44**

Overall, the survey generated 62 responses in total representing a 38% response rate based on the total number of universities targeted. While there was some variation in response rates across individual regions and nations, when aggregated to four high-level areas (North, Midlands & South West, Greater South East, and Scotland, Wales & Northern Ireland) the sample response rates are much more balanced.

The sample is, however, biased towards the research-active universities, with 64% of universities in KEF cluster V responding, 66% of those in cluster X, and 47% of those in cluster E. By contrast, just 23% of universities in clusters J and M responded to the survey. Just one specialist Arts university responded. Given that specialist Arts universities are quite different from other universities in how they contribute to R&D and innovation in the UK, we excluded these universities from both our target and achieved samples and our analysis. This resulted in a target population of non-arts specialist universities of 140 and an achieved sample of 61 (overall response rate of 44%) (Table 2).

To help correct for the non-response biases resulting from differential response rates from different types of universities, a set of post-stratification weights were calculated and applied to the analysis[4].

4 The post-stratification weights were calculated using the statistical software Stata v16.1 as part of the survey estimation commands. The method followed by Stata is based on Levy and Lemeshow (2008) and is set out in detail in the Stata manual on post-stratification available at www.stata.com/manuals13/svypoststratification.pdf

04 UNIVERSITIES AND INNOVATION PRE-COVID-19

This section presents key findings from the survey on how universities contributed to innovation pre-COVID-19. This helps to establish a baseline for investigating how the roles of universities might change as we move through the immediate crisis into the economic recovery. It then explores where, in terms of sectors of the economy, universities had their most significant engagements before the crisis began in March 2020. Given the uneven effects of the economic consequences of the pandemic on different sectors of the economy, the survey provides insights both on the exposure of universities to disruption to demand for their innovation-focused activities. More importantly, it highlights key sectors where significantly greater effort may be required to sustain relationships through the crisis to enable universities to support innovation and sectoral adaptation and renewal in order to drive the economic recovery.

4.1 Importance of different types of innovation-focused activities for universities

The survey gathered insights from the senior university leaders and managers with strategic knowledge of their innovation, enterprise, knowledge exchange, business engagement or equivalent activities. It asked respondents to indicate the importance placed by the university on a variety of activities aimed at supporting the innovation objectives of their external partners. Respondents rated each activity on a scale from 0 (no importance) to 10 (extremely important).

Many surveys have explored how much activity involving universities and external partners is being channelled through different types of knowledge exchange mechanisms. In this survey we switch our attention from this focus on knowledge exchange mechanisms to the innovation functions they aim to develop or provide – i.e. what they contribute directly to the development and deployment of new innovations and the functioning of the innovation system. **Activities were grouped into three broad categories:**

- **R&D activities**
- **Innovation-focused services and support** beyond R&D
- **Services and support targeted at strengthening the innovation system** to enable the development, diffusion and deployment in practice of new technologies and ideas

4.1.1 R&D activities

Figure 2 presents the weighted survey findings for the importance universities place on different types of R&D activities to support the innovation objectives of their external partners. It presents both the distribution of responses across the importance scale and the mean score. Table 3 then presents the mean score for different types of universities (categorised by KEF cluster). Across the UK university system the vast majority of universities see use-inspired basic research and applied research as at least very important, with almost half of universities citing applied research as extremely important. Further, challenge-driven programmes and centres of excellence that integrate research of different types and disciplines and provide targeted support for its further development and transfer into practice was cited by a third of universities being extremely important for them in delivering their innovation-focused objectives.

Figure 2

Importance placed by universities in the three years to March 2020 on different types of R&D activities to support the innovation objectives of their external partners

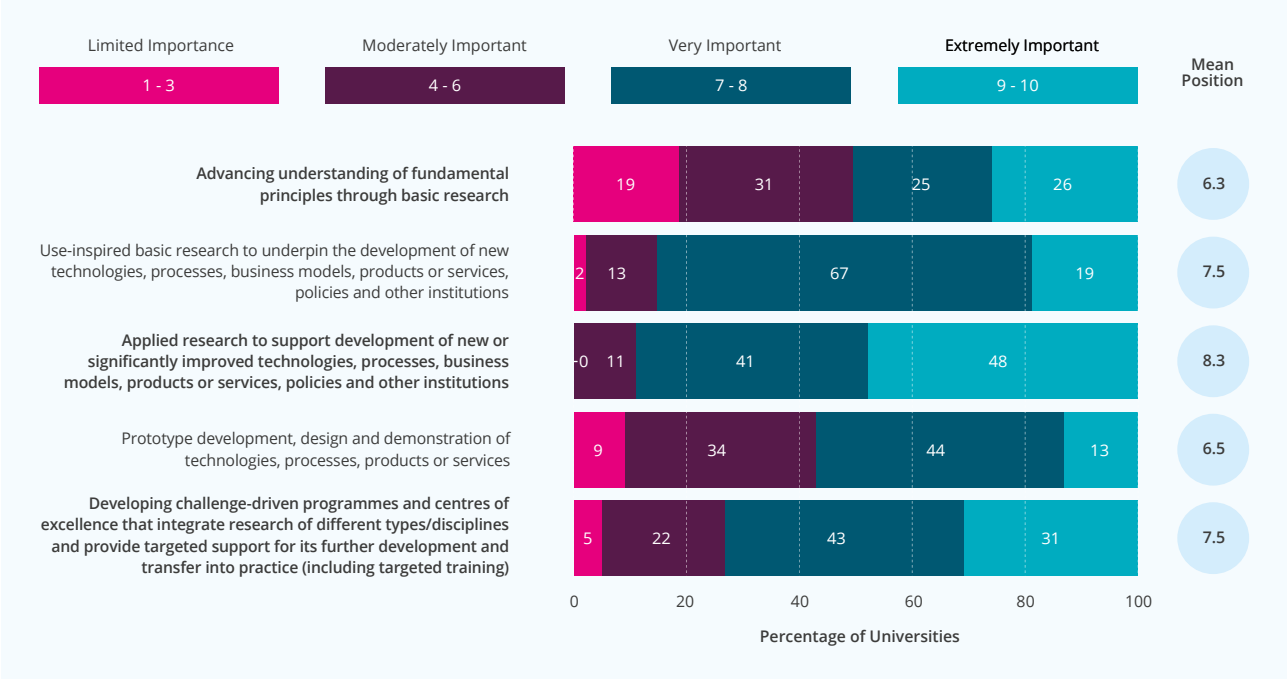


Table 3

Mean importance placed by universities in the three years to March 2020 on different types of R&D activities to support the innovation objectives of their external partners, variation by KEF cluster

R&D activities	All	Cluster				Variation across clusters‡
		KEF_V	KEF_X	KEF_E	KEF_JM	
Advancing understanding of fundamental principles through **basic research**	6.3	8.9	7.9	5.1	5.2	***
Use-inspired basic research to underpin the development of new technologies, processes, business models, products or services, policies and other institutions	7.5	8.4	8.1	6.5	7.7	***
Applied research to support development of new or significantly improved technologies, processes, business models, products or services, policies and other institutions	8.3	7.6	8.1	7.7	9.1	*
Prototype development, design & demonstration of technologies, processes, products or services	6.5	6.6	6.4	5.8	7.1	
Developing **challenge-driven programmes and centres of excellence** that integrate research of different types/disciplines and provide targeted support for its further development and transfer into practice (inc. targeted training)	7.5	8.1	7.8	6.6	7.7	†

‡ Based on the Kruskal-Wallis non-parametric test. Levels of significance: *** 1%; ** 5%; * 10%.

The breakdown of these results by KEF cluster reveals the expected pattern; that the research-intensive universities in the V and X clusters see basic research and use-inspired basic research as particularly important compared with the less research intensive E and JM clusters. Challenge-driven programmes are also particularly highly scored by the V and X clusters. By contrast, universities in the JM cluster see score applied research very highly compared with the other clusters.

It is often alleged that a primary function of universities is in delivering early stage R&D. What our survey shows is that 57% of universities in the UK also see their direct involvement in prototype development, design and demonstration of technologies, processes, products or services as at least very important to delivering their innovation objectives with external partners. These activities can be important for helping to de-risk ideas and technologies emerging from their research before the private sector is willing to engage and invest.

4.1.2 Innovation-focused services and support beyond R&D

Figure 3 turns to the wider innovation-focused services and support, beyond R&D, that universities are known to provide. The results show that 84% of universities see helping partners in identifying new directions and opportunities for innovation as at least very important (30% extremely important). Further, 68% of universities in the UK cite services to support their partners in prototyping, designing, demonstrating, testing, producing and taking to market new technologies, processes and products/services as at least very important; and 75% similarly cite supporting partners in solving technical problems. Helping partners to identify and adopt new technologies, processes and systems to improve efficiency, productivity and resilience is cited by 69% of UK universities. This function is particularly crucial for helping the 'long tail' of less productive firms to raise their productivity. Many universities also see important roles in developing and providing access to specialist facilities and equipment to support the development of new technologies, and in building networks to convene and better connect organisations to facilitate the innovation process.

Unlike universities' importance attached to different types of R&D activities for external partners, the importance attached to innovation-focused services and support beyond R&D shows little statistical variation between types of universities (Table 4).

Figure 3

Importance placed by universities in the three years to March 2020 on different types of innovation-focused services and support (beyond R&D) to support the innovation objectives of their external partners

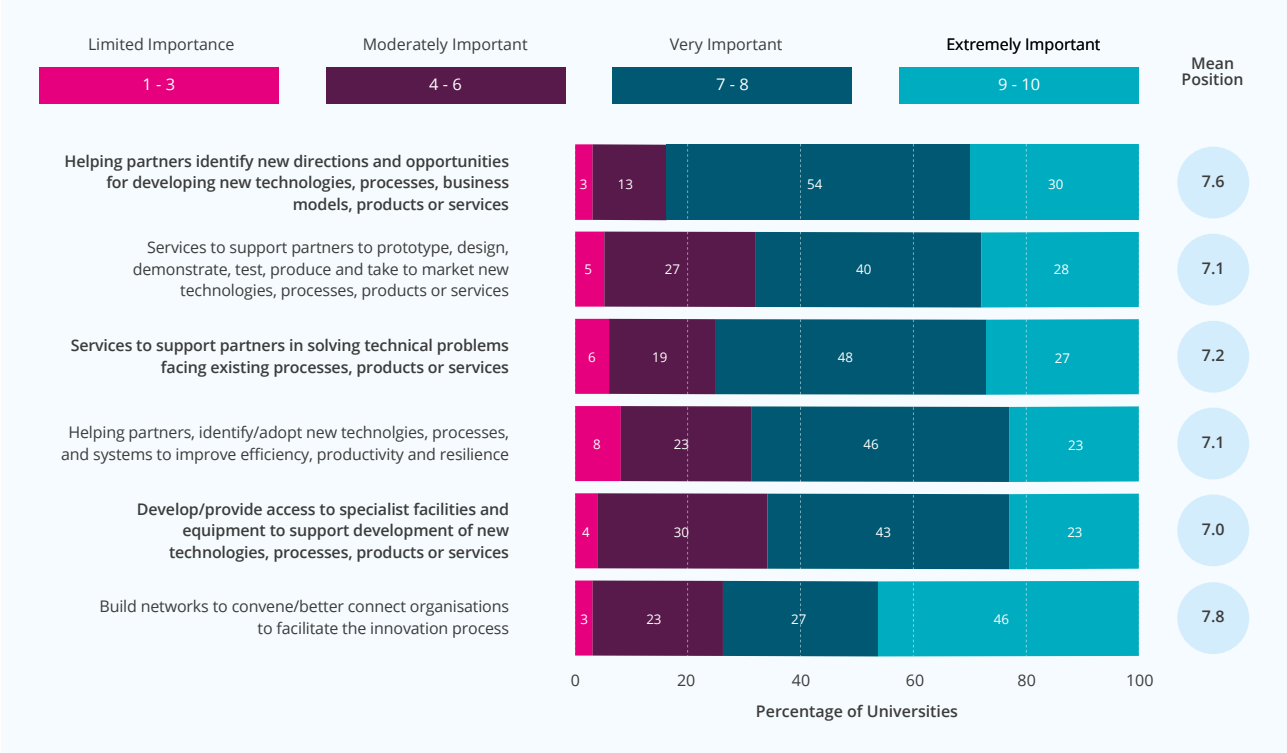


Table 4

Mean importance placed by universities in the three years to March 2020 on different types of innovation-focused services and support (beyond R&D) to support the innovation objectives of their external partners, variation by KEF cluster

Innovation-focused activities beyond R&D	All	Cluster				Variation across clusters‡
		KEF_V	KEF_X	KEF_E	KEF_JM	
Helping partners **identify new directions and opportunities** for developing new technologies, processes, business models, products or services	7.6	7.8	7.6	7.1	7.7	
Services to support partners to **prototype, design, demonstrate, test, produce and take to market** new technologies, processes, products or services	7.1	6.9	6.8	6.5	7.8	
Services to support partners in **solving technical problems** facing existing processes, products or services	7.2	6.4	6.8	7.1	7.8	†
Helping partners **identify/adopt new technologies, processes, and systems** to improve efficiency, productivity and resilience	7.1	6.3	6.7	6.7	7.6	
Develop/provide **access to specialist facilities and equipment** to support development of new technologies, processes, products or services	7.0	7.1	6.7	6.3	7.7	
Build networks to convene / better connect organisations to facilitate the innovation process	7.8	7.4	7.5	6.9	8.5	

‡ Based on the Kruskal-Wallis non-parametric test. Levels of significance: *** 1%; ** 5%; * 10%.

4.1.3 Services and support for enabling the development and diffusion of innovations

The third set of activities explored in the survey are those related to strengthening the system that underpins the ability of firms and other organisations to innovate. The results show that developing workforce skills (including through training and recruitment of students) was at least very important for most UK universities (mean score of 7.6), as was providing entrepreneurial education to staff, students and local communities (mean score of 7.5), efforts to strengthen the innovation and entrepreneurial culture within the system (mean score of 7.2), and providing leadership and intelligence to inform strategic development of places and sectors (mean score of 7.2).

The importance attached to services and support for strengthening the innovation system shows some variation across KEF cluster (Table 5). In particular, universities in clusters V, X and JM are much more likely to see investing effort in raising the public understanding of new technologies – an important function in helping to develop public acceptance and legitimacy – as an important function for their institution compared with those in cluster E. Further, support for spinouts and start-ups is particularly dominated by the large research active universities of cluster V.

Figure 4

Importance placed by universities in the three years to March 2020 on services and support targeted at strengthening the innovation system to enable the development, diffusion and deployment in practice of new technologies and ideas

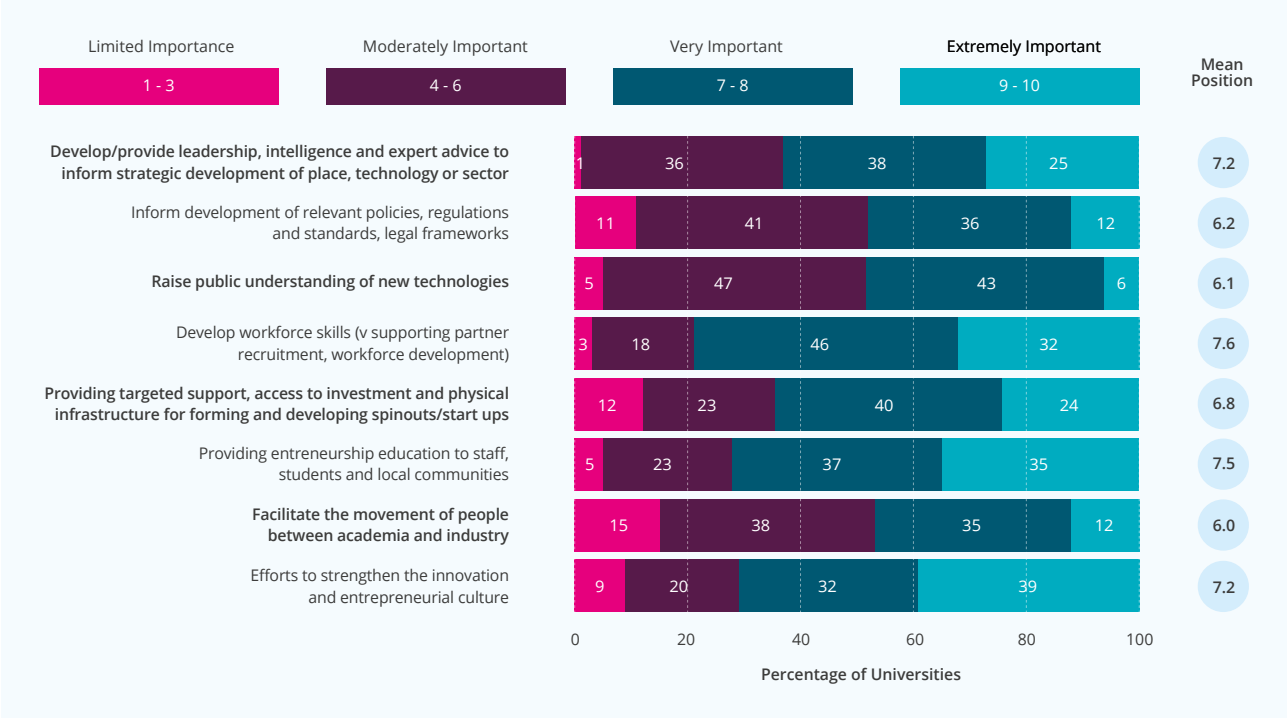


Table 5

Mean importance placed by universities in the three years to March 2020 on support for strengthening the innovation system to enable the development, diffusion and deployment in practice of new technologies and ideas, variation by KEF cluster

Innovation system strengthening	All	Cluster				Variation across clusters‡
		KEF_V	KEF_X	KEF_E	KEF_JM	
Develop/provide **leadership, intelligence and expert advice to inform strategic development** of place, technology or sector	7.2	7.1	7.5	6.7	7.4	
Inform development of **relevant policies, regulations and standards, legal** frameworks	6.2	6.1	6.5	5.3	6.4	
Raise public understanding of new technologies (e.g. ethical implications)	6.1	6.9	6.3	4.7	6.4	***
Develop workforce skills (inc. supporting partner recruitment, workforce development)	7.6	6.6	6.5	7.7	8.5	**
Providing targeted s**upport, access to investment, and physical infrastructure for forming and developing spinouts/start-ups**	6.8	8.3	6.9	5.8	7.1	**
Providing **entrepreneurship education** to staff, students and local communities	7.5	6.9	7.4	7.3	7.8	
Facilitate the **movement of people** between academia and industry	6.0	5.9	6.3	5.0	6.0	
Efforts to strengthen the **innovation and entrepreneurial culture**	7.2	7.4	7.7	6.9	6.9	

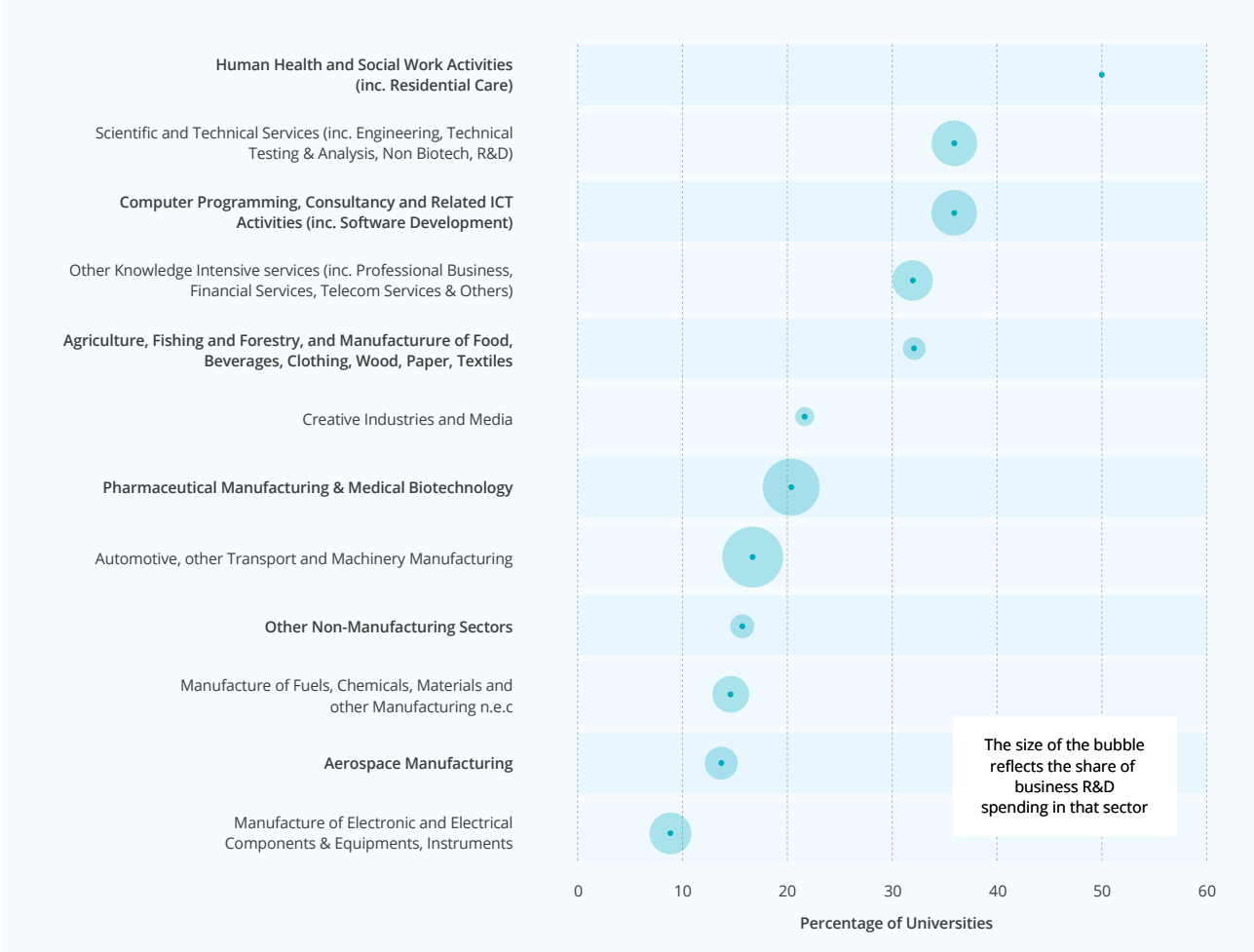
‡ Based on the Kruskal-Wallis non-parametric test. Levels of significance: *** 1%; ** 5%; * 10%.

4.2 Top sectors for universities' innovation-focused activities and engagements

Much of the focus of the debate on universities and R&D and innovation has historically centred on their roles and contributions to R&D intensive and other manufacturing sectors such as the aerospace and defence, pharmaceuticals and automotive industries. Our survey – which gathered responses from across all types of university across all regions of the UK – asked the senior university leaders and managers to identify the top three sectors of the economy with which their institution had the most significant level of innovation-focused engagements. These have been aggregated into sectoral groups to maintain confidentiality of responses[5].

Figure 5 presents the weighted survey results for the sector groups. It shows that half of UK universities identified human health and social work as a key sector for their innovation-focused engagements. Approximately a third identified scientific and technical services (including engineering services, technical testing and analysis, and non-biotechnology R&D services), computer programming and related ICT, and other knowledge intensive services (including professional business services, financial services and telecoms services) as key sectors. By contrast, just 20% of universities identified the pharmaceutical manufacturing and medical biotechnology as a key sector, 17% identified automotive, other transport and machinery manufacturing, and 14% identified aerospace manufacturing.

Figure 5 **Top sectors for innovation-focused engagements by universities in the three years to March 2020**



Note: Universities were asked to identify the top 3 sectors of the economy with which they have the most significant innovation-focused engagements.

5 The full list of sector options available to survey respondents and the mapping into sector groups are provided in Appendix A.

Table 6 **Top sectors for universities' innovation-focused engagements by KEF cluster**

KEF Cluster	Top sectors	Proportion of responses (%)
KEF_V	Pharmaceutical Manufacturing & Medical Biotechnology	86
	Aerospace manufacturing	57
	Manufacture of electronic and electrical components & equipments, instruments	36
	Manufacture of fuels, chemicals, materials, and other manufacturing n.e.c	29
KEF_X	Scientific and technical services (inc. engineering, technical testing & analysis, non-biotech. R&D)	58
	Human health and social work activities (inc. residential care)	53
	Pharmaceutical Manufacturing & Medical Biotechnology	32
	Other knowledge-intensive services	32
KEF_E	Human health and social work activities (including residential care)	67
	Computer programming, consultancy and related ICT activities (inc. software development)	47
	Automotive, other transport, and machinery manufacturing	33
	Scientific and technical services (inc. engineering, technical testing & analysis, non-biotech. R&D)	33
KEF_JM	Human health and social work activities (inc. residential care)	60
	Computer programming, consultancy and related ICT activities (inc. software development)	60
	Agriculture, fishing and forestry, manufacture of food, beverages, clothing, wood, paper, textiles	50
	Creative industries and media	40

What becomes abundantly clear is the significant variation in sectoral focus for universities of different types. Table 6 presents the top sectors for each KEF cluster. For cluster V, 86% of universities identified life sciences and 57% identified aerospace manufacturing. For cluster X, 58% identified scientific and technical services and 53% identified human health and social work. For both clusters E and JM, human health and social work, and computer programme and related ICT were seen as key top sectors. Cluster JM also identified agriculture, forestry and fishing and the creative industries as key sectors, and cluster X identified automotive and other transport manufacturing and scientific and technical services.

Summary of key findings

Pathways to innovation impacts: What is clear from this section is the sheer breadth of ways through which universities contribute to innovation and the development of the system that enables innovation to happen. Contributions are made not just through the different types of basic, use-inspired and applied R&D, but also through support provided to partners for identifying new opportunities at the later stages of the innovation process. Many universities see a wide range of activities aimed at strengthening the innovation system to enable the development, diffusion and deployment in practice of new technologies and ideas, not least by providing leadership, advice and intelligence to support the strategic development of places and sectors, developing skills within the system, and in helping to build an entrepreneurial and innovation culture.

Key sectors for universities' innovation-focused activities: Universities contribute to innovation across a wide range of manufacturing and services industries. There is some evidence of specialisation within the university system in terms of the sectors with which they have most significant links. The large research intensive universities of the KEF cluster V are more likely to identify pharmaceutical manufacturing and medical biotechnology, aerospace manufacturing, and the manufacture of electronic & electrical components and instruments, as key sectors. By comparison smaller teaching-led and less research intensive universities of KEF Cluster JM identified sectors such as human health and social work, computer programming and related ICT, agriculture and fishing, and the creative industries as key sectors.

05 THE EFFECT OF THE COVID-19 PANDEMIC ON UNIVERSITIES' INNOVATION ACTIVITIES

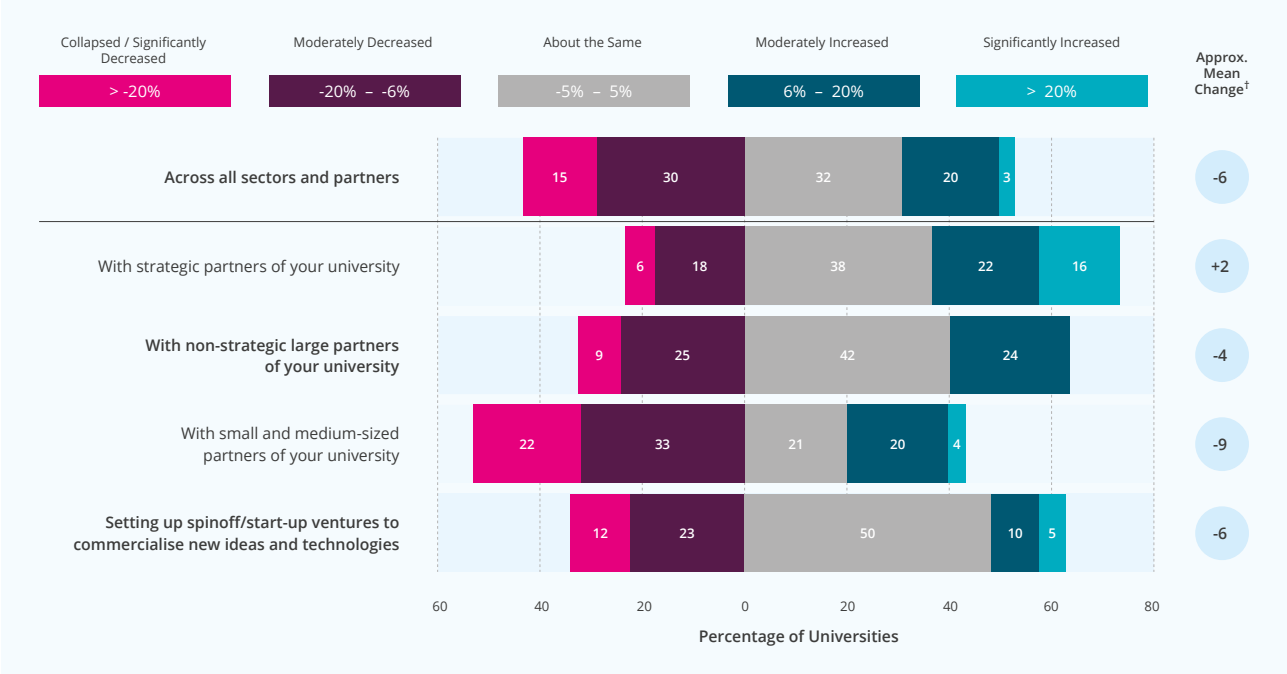
As the nations of the UK went into lockdowns in March 2020, economic activity – including the R&D and innovation activities of organisations – was severely disrupted. Universities were no different. Like many other organisations, they were forced to close their buildings to everything but essential activity, and attempted to move as much activity as possible to online and remote working.

This section presents the evidence gathered through the survey on how the first wave of COVID-19 and the initial national lockdown period (March – July 2020) affected universities' innovation-focused partnerships, commercialisation and other knowledge exchange activities, and their ability to continue to deliver such activities through the crisis. We refer to the period between 23rd March 2020 and July 2020 as the 'Lockdown'.

5.1 Effects on the level of innovation-focused activity with different types of partners

Looking across all sectors and partners, 45% of universities claimed their innovation-focused activities with external partners had decreased either moderately (6-20% drop) or significantly (more than 20% drop) during Lockdown (compared to pre-Covid levels) (Figure 6). By contrast, almost a third of universities, looking across their overall portfolio, believed such activity remained about the same, while 23% saw activity increase. Using the mid-points from each category, we estimate that innovation-focused activities between universities and their external partners fell by around 6% during Lockdown.

Figure 6 **Change in the level of innovation-focused activities with different types of partners during Lockdown**



†: Mean change estimated by taking the following points in each category: Collapsed (-51%); significantly decreased (-35%); moderately decreased (-13%); about the same (0%); moderately increased (13%); significantly increased (21%).

However, the effects vary considerably when looking at engagements with different types of partners. Perhaps unsurprisingly the most negatively affected were innovation-activities between universities and small and medium-sized enterprises (SMEs); 22% of universities claimed activity with these partners had significantly decreased or collapsed and a further 33% claimed activity had moderately decreased. By contrast, 16% of universities claimed activities with their strategic partners had significantly increased (by 20% or more) during Lockdown and a further 22% claimed activities with their strategic partners had moderately increased. Half of universities claimed there was limited change in their activities to set up spinouts/start-up ventures to commercialise new ideas and technologies.

Table 7 **Estimated mean percent change† in the level of innovation-focused activities with different types of partners during Lockdown, by KEF cluster**

R&D activities	All	Cluster				Variation across clusters‡
		KEF_V	KEF_X	KEF_E	KEF_JM	
With strategic partners of your university	2	-7	6	-1	5	**
With non-strategic large partners of your university	-4	-7	-1	-8	-1	
With small and medium-sized partners of your university	-9	-10	-2	-20	-3	**
Setting up spinoff/start-up ventures to commercialise new ideas and technologies	-6	0	-7	-2	-11	
All types of partners	-6	-6	-1	-12	-3	

†: Mean change estimated by taking the following points in each category: Collapsed (-51%); significantly decreased (-35%); moderately decreased (-13%); about the same (0%); moderately increased (13%); significantly increased (21%).

‡ Based on the Kruskal-Wallis non-parametric test. Levels of significance: *** 1%; ** 5%; * 10%.

The COVID-19 pandemic and Lockdown have also affected some universities more than others (Table 7). This is inevitably shaped in part by the sectoral portfolio of a given university. For example, while the estimated mean change in the level of innovation-focused activities at universities in the KEF-V cluster decreased by around 6% during Lockdown, universities in the X-cluster experienced a decrease of just 1%. By contrast activity in KEF-E cluster universities decreased by around 12%.

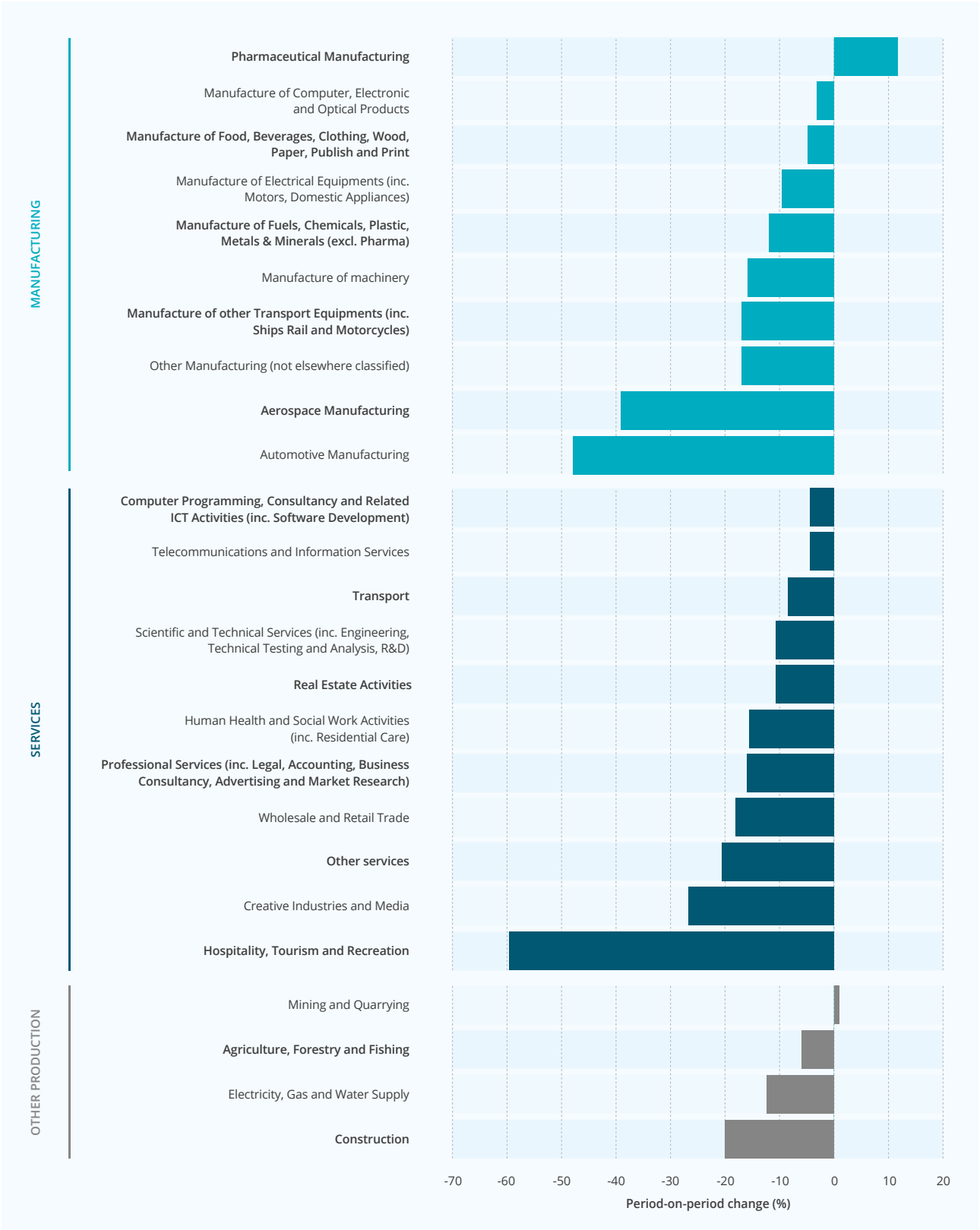
Significant variation was also seen in the changes in the level of activities with different types of partners, in particular with strategic partners (cluster X and JM universities experienced an increase while cluster V universities saw a decrease of around 7%) and SMEs (with universities in clusters V and E witnessing much more dramatic decreases than those in clusters X and JM).

5.2 Effects on the level of innovation-focused activity with different sectors of the economy

We know from wider industrial economic performance data that some sectors have been affected disproportionately more than others by the pandemic and the national Lockdown in the UK (Figure 7). Most sectors, with the exception of pharmaceutical manufacturing and mining and quarrying, exhibited quite substantial declines in output. Aerospace and automotive manufacturing, the creative industries and media, and the hospitality, tourism and recreation sectors experienced the largest declines.

Figure 7

Change in sector output between January-March 2020 and May-July 2020 (%)



Note: * Data for agriculture, forestry and fishing drawn from ONS GDP first quarterly estimate time series (PN2) and is based on period-on-period change from 2020 quarter 1 (January-March) to 2020 quarter 2 (April – June).

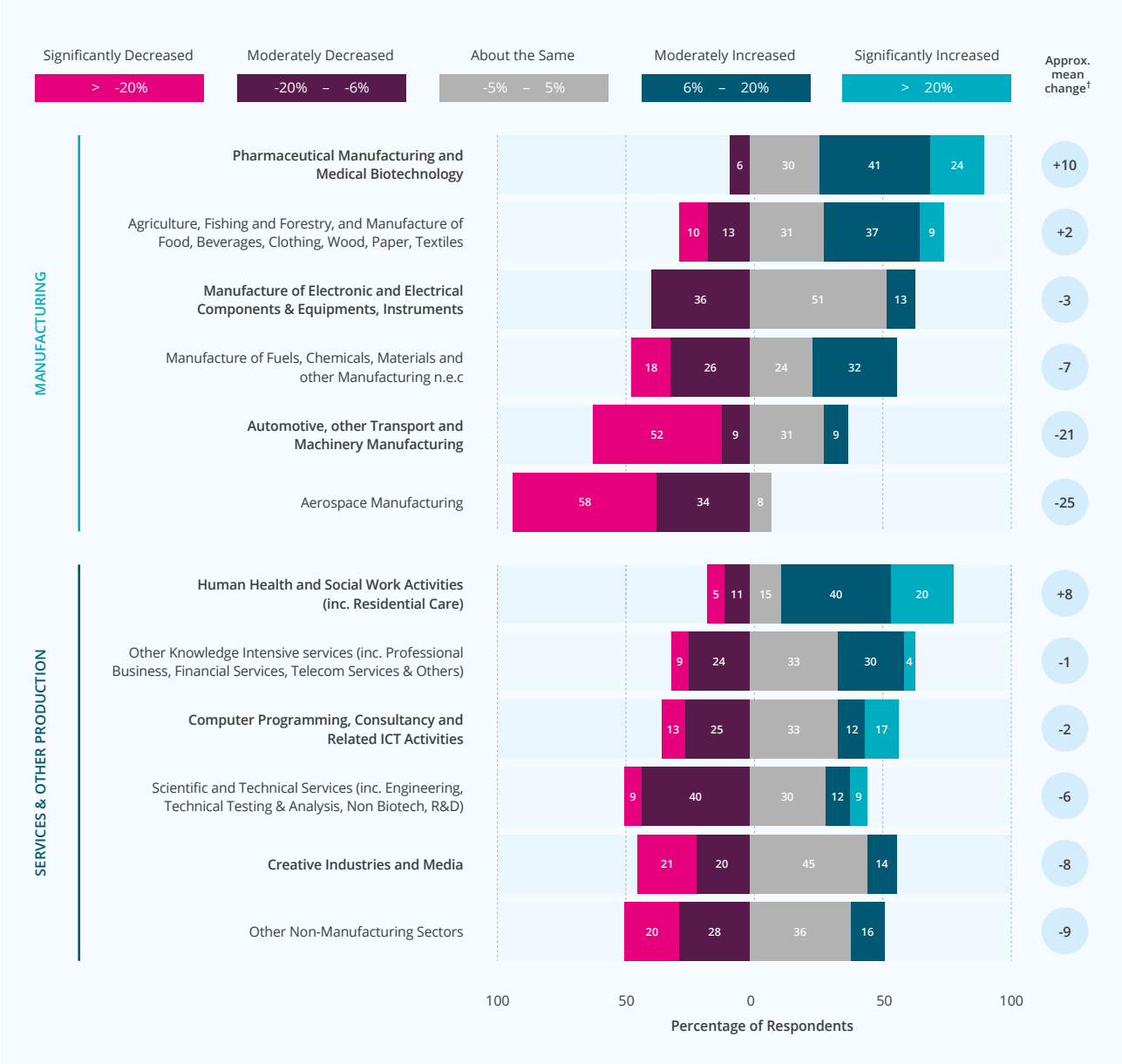
Sources: ONS Index of Production September 2020, ONS Index of Services September 2020, ONS Output in the construction industry September 2020.

The significant negative effects of the pandemic on many sectors of the economy appear to have fed through to the level of innovation focused activities between universities and partners in different sectors (Figure 8, Figure 9). By far, innovation activities between universities and partners in the aerospace and automotive/other transport manufacturing sectors have seen the largest falls, with 58% and 52% respectively of those universities identifying these as top sectors claiming such activity has decreased by more than 20% during Lockdown. By contrast activities with life sciences partners has increased by at least 6% for 57% of universities identifying them as a top sector.

Innovation-focused activities with services and other production sectors also exhibit quite a lot of variation between sectors, with the creative industries, and scientific and technical services particularly badly affected during the Lockdown by comparison with activities with partners in human health and social work and in agriculture, forestry and fishing.

Figure 8

Change in the level of innovation-focused activities with different top sectors between pre-Covid and Lockdown



†: Mean change estimated by taking the following points in each category: Collapsed (-51%); significantly decreased (-35%); moderately decreased (-13%); about the same (0%); moderately increased (13%); significantly increased (21%).

Figure 9

Relationship between change in the sector output during Lockdown and the change in level of innovation activity between universities and partners in the sector

Notes: (i) change in sector output for other knowledge intensive services (Other_KIS) excludes financial and insurance services; (ii) mean change estimated by taking the following points in each category: Collapsed (-51%); Significantly decreased (-35%); Moderately decreased (-13%); About the same (0%); Moderately increased (13%); Significantly increased (21%).

Sources: ONS Index of Production September 2020, ONS Index of Services September 2020, ONS Output in the construction industry September 2020, ONS GDP first quarterly estimate time series (PN2), UCI/NCUB survey of universities 2020.

5.3 Nature of changes

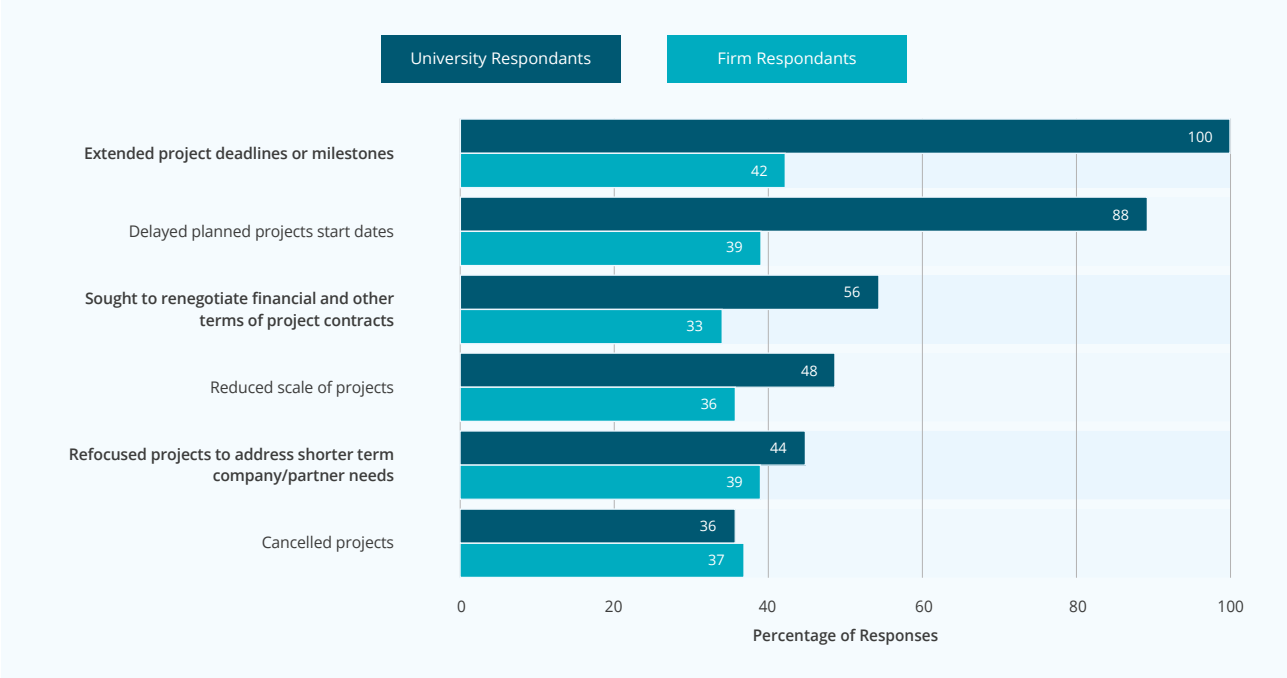
Where universities had experienced an overall decrease in their innovation activities with external partners during Lockdown, the survey explored the types of the changes being made. Respondents were asked to identify changes that affected a significant proportion (at least 10%) of their engagements. Figure 10 presents the unweighted results and shows that all of those responding to this question cited project deadlines or milestones being extended and 88% cited planned project start dates being delayed. Just over half claimed that partners were seeking to renegotiate financial and other terms of project contracts, and 48% noted that the scale/scope of projects was being reduced. During Lockdown 36% of universities saw a significant proportion of their activities and projects with external partners being cancelled.

A parallel survey of R&D active firms was circulated by NCUB/UCI during September 2020 looking at how the pandemic has affected their R&D activities and links with universities. It asked those firms with links with universities going into Lockdown whether they had made any changes to their engagements. Figure 10 presents their results

alongside the responses of universities to the same question. It shows that 42% of firms extended project deadlines or milestones, 39% delayed planned start dates, 39% refocused projects to address shorter term needs, and 37% cancelled projects. Combining options, 72% of firms either extended, delayed or cancelled projects, and 62% reduced or refocused projects.

Comparing the results from the university and firm surveys suggests that some of these effects are being broadly felt across the university sector, while others are more concentrated in particular universities.

Figure 10 **Nature of changes being made to innovation-focused activities and projects with external partners**



Note: only universities indicating their overall level of innovation-focused activities and partnerships had declined answered this question. Results based on unweighted survey sample.

Number of university responses: 25; number of firm responses: 156 (micro, small & medium sized (fewer than 250 employees = 45; large (between 250 and 1000 employees) = 53; large (more than 1000 employees) = 58).

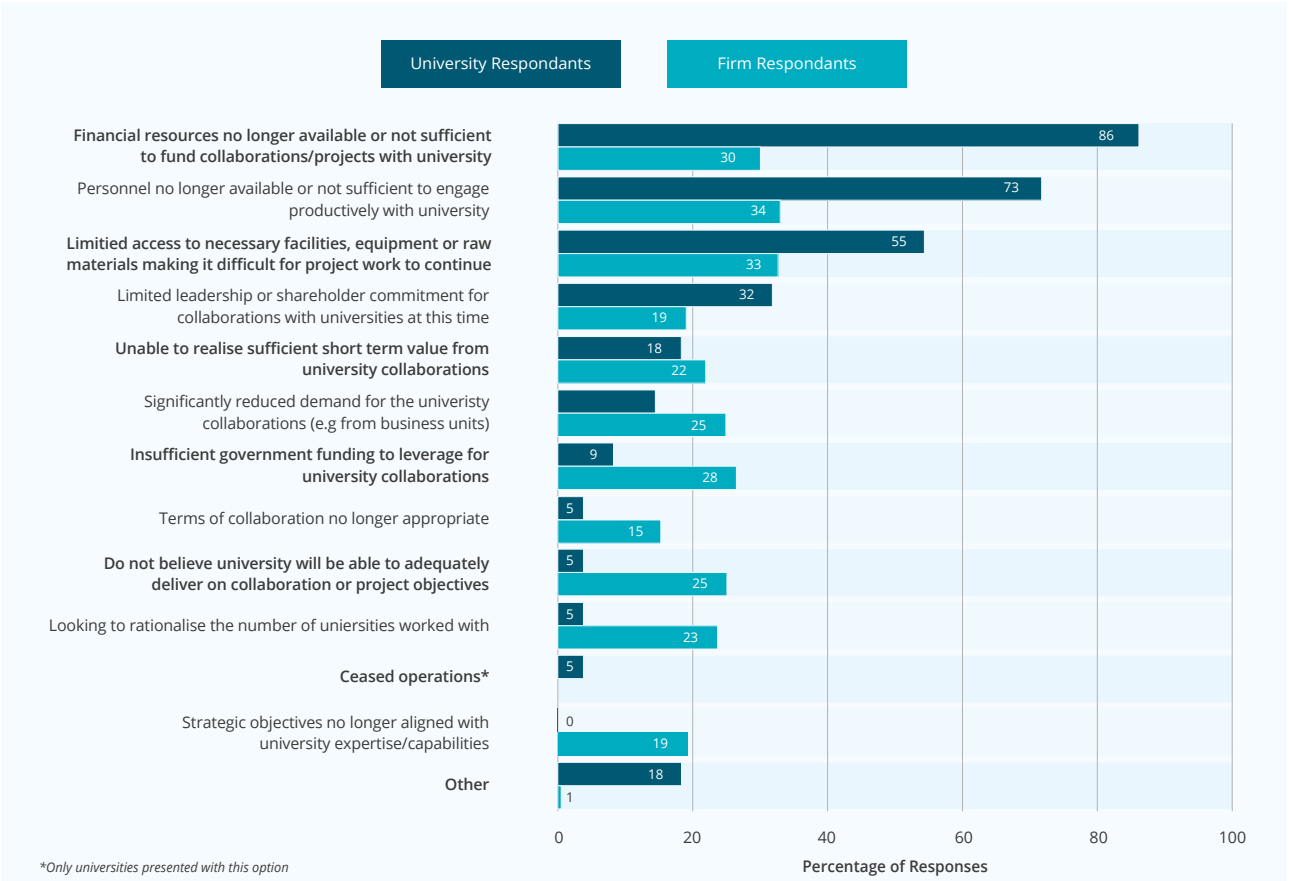
Sources: UCI/NCUB survey of universities 2020; NCUB/UCI survey of firms 2020.

With many universities and their industrial partners under significant financial pressures as a result of the pandemic, it is encouraging to see that efforts are being made to preserve projects rather than cancel them. However, it begs the question of how long universities and their partners will be able to continue to extend or delay projects without additional financial support to meet project fixed costs before difficult decisions will have to be made to stop the work.

5.4 Reasons for changes

The survey also asked universities, where they were experiencing reductions in the overall scale of their innovation-focused activities and projects, for their perceptions of why their partners were doing so. The reasons are captured in Figure 11. Most cited that financial resources within their partners were no longer available to fund collaborations and projects with universities, and 73% noted that personnel within their partners were no longer available (in sufficient numbers) to engage productively with the university (e.g. due to being furloughed, diversion to other tasks or because of redundancy). Just over half of university respondents to this question also believed limited access to facilities, equipment or raw materials made it difficult for project work to continue. Around a third also believed that there was limited leadership commitment within their partners for collaborations with universities at this time.

Figure 11 **Main reasons why external partners of universities are seeking to reduce activity**



Note: Within university survey, only universities indicating their overall level of innovation-focused activities and partnerships had declined answered this question. Results based on unweighted survey sample.

Number of university responses: 22; number of firm responses: 150 (micro, small & medium sized (fewer than 250 employees = 43; large (between 250 and 1000 employees) = 50; large (more than 1000 employees) = 57).

Sources: UCI/NCUB survey of universities 2020; NCUB/UCI survey of firms 2020.

The parallel NCUB/UCI survey of R&D active firms also explored this issue. Figure 11 presents their results alongside the perceptions of universities[6]. It shows that the firms responding provided a much wider range of reasons than universities perceive to be driving firm behaviour. In particular beyond the pressures of finances and personnel and access to facilities, a quarter of firm respondents made changes because they did not believe that the university would be able to adequately deliver on their project objectives. Almost one in three respondents cited insufficient government funding to leverage for university collaborations given their current circumstances as a key reason for making changes. A quarter of firm respondents noted significantly reduced demand for university collaborations (for example from their business units), 19% cited limited leadership commitment, and 19% claimed that their strategic objectives were no longer aligned with university expertise and capabilities.

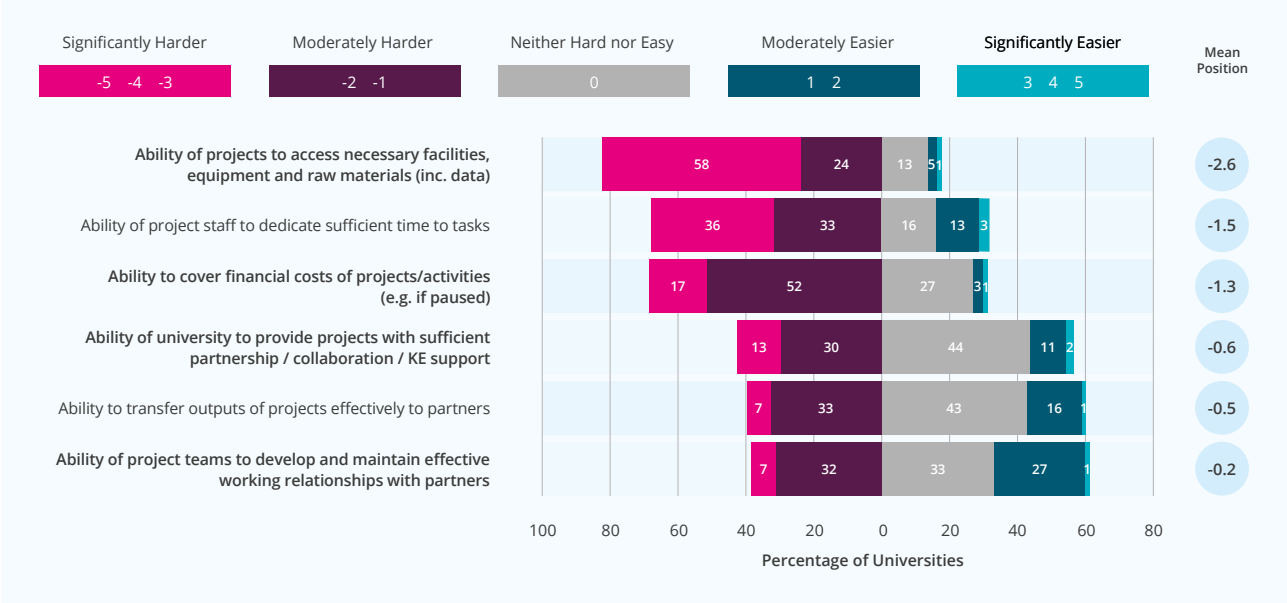
Worryingly for some universities over the longer term, 23% of firm respondents claimed a main reason for making changes to the level of innovation activities with universities was that they are looking to rationalise the number of universities they work with. A deeper dive into this figure showed that this was dominated by respondents in manufacturing sectors (34% of manufacturing firm respondents compared with just 5% of respondents in non-manufacturing sectors), and in particular those in the life sciences sector (56% of life sciences respondents).

6 In comparing these results it must be pointed out that universities were reflecting on their perceptions of what is happening across multiple partners who have made decisions to reduce the level of their activities. By contrast, the firm is reflecting on the reasons behind its own decision.

5.5 Initiating and delivering innovation activities during Lockdown

The imposition of a national Lockdown in March 2020 to deal with the urgent health crisis sweeping the UK led to universities having to rapidly reconfigure the way they operate. All non-essential staff were sent home and asked to work remotely where possible, and non-critical buildings closed. This caused significant disruption to their ability to continue to provide their core 'services', including delivering on their existing innovation-focused projects and activities for external partners. The survey explored the extent to which the Lockdown had affected their ability to ensure the necessary resources and support were available to deliver such projects. Figure 12 presents the results, with respondents rating their ability to ensure a particular resource or support was available on a scale of -5 (significantly harder) to 5 (significantly easier).

Figure 12 **Ability of universities to ensure necessary resources and support are available to deliver existing innovation-focused projects and activities for external partners**



The survey, unsurprisingly, found that the ability of projects to access the necessary facilities, equipment and raw materials (including data which may be stored securely on campus or only made accessible through campus-based infrastructure) was most negatively affected by the Lockdown, with 58% of universities finding it significantly harder. Just over a third claimed it was significantly harder for staff to dedicate sufficient time to project tasks, with a further third noting it was moderately harder. Sixty-nine percent of universities claimed they were finding it at least moderately harder to cover the financial costs of projects and activities (for example where they were paused).

Interestingly some universities found some benefits from being forced to work remotely. Twenty-eight percent of universities claimed that project teams found it at least moderately easier to develop and maintain effective working relationships with partners (although 39% of universities found it at least moderately harder); and 17% of universities found it at least moderately easier to transfer outputs of projects to partners.

5.6 Ability to initiate new innovation-focused projects and collaborations

The survey also looked at how the pandemic and Lockdown had affected the ability of universities to initiate new innovation-focused projects or collaborations with external partners. It found that most universities were able to secure new funded innovation-focused activities and projects during Lockdown. Variation, however, was seen across the type of partners with which projects were secured: while 86% of universities were able to secure projects from their strategic or other long-standing partners and 83% from SMEs, just 63% were able to do so from other large (non-strategic or long-standing) partners (statistically significant at the 1% level).

Table 8

Proportion of universities able to secure new funded innovation-focused projects or collaborations with partners during Lockdown (%)

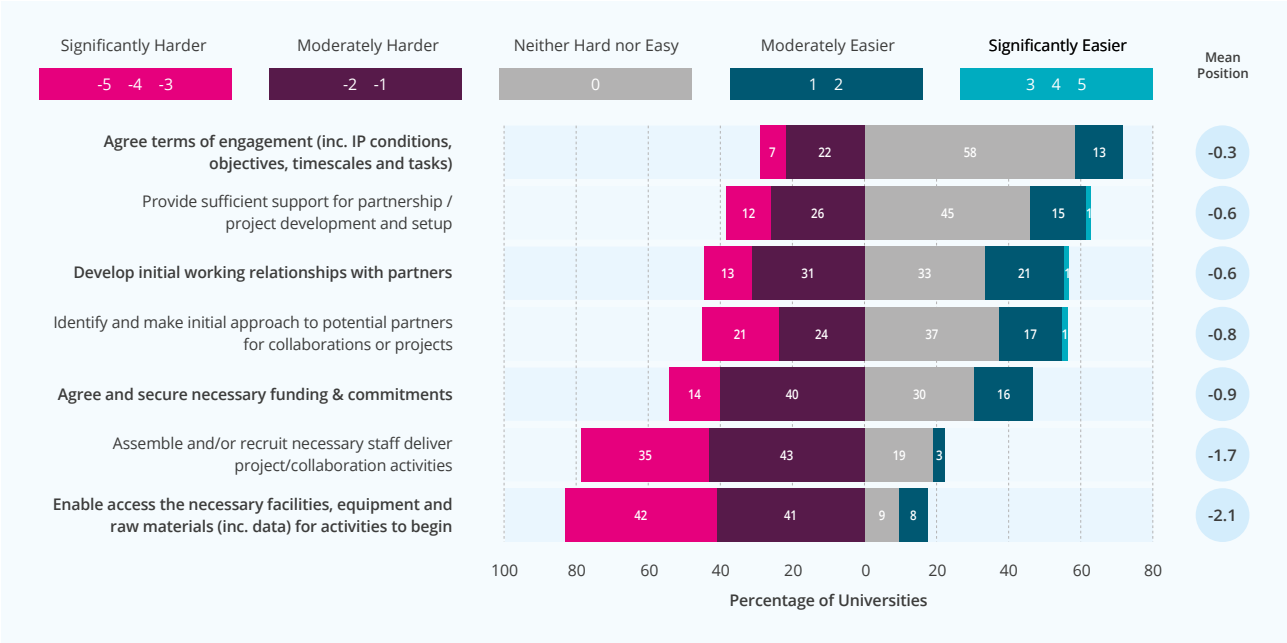
Type of partner	All	Cluster‡			
		KEF_V	KEF_X	KEF_E	KEF_JM
Strategic or other large long-standing partners of your university	86	86	95	86	80
Other large partners of your university	63	100	63	67	44
		X;E;JM	V;JM	V;JM	V;X;E
Small and medium-sized partners of your university	83	100	95	93	60
		JM	JM	JM	V;X;E

‡ For each cluster the second row for each funding source identifies those other clusters for which a pairwise comparison of the result is statistically different based on the non-parametric Dunn's test.

Further, it is clear that different universities have had quite different experiences during Lockdown in their ability to secure new funded projects. While there is little variation across KEF clusters for securing projects from universities' strategic partners, significant differences were observed when it came to working with other large (non-strategic) partners of universities. In particular all universities in the large research intensive V cluster were able to secure projects during lockdown from these types of partners. By comparison, just 63% and 67% of universities from clusters X and E respectively were able to do so, and just 44% of the smaller, more teaching intensive universities in cluster JM. Further, universities in cluster JM were much less likely than other universities to secure projects from SMEs during Lockdown.

Figure 13

Ability to initiate new innovation-focused projects or collaborations with external partners



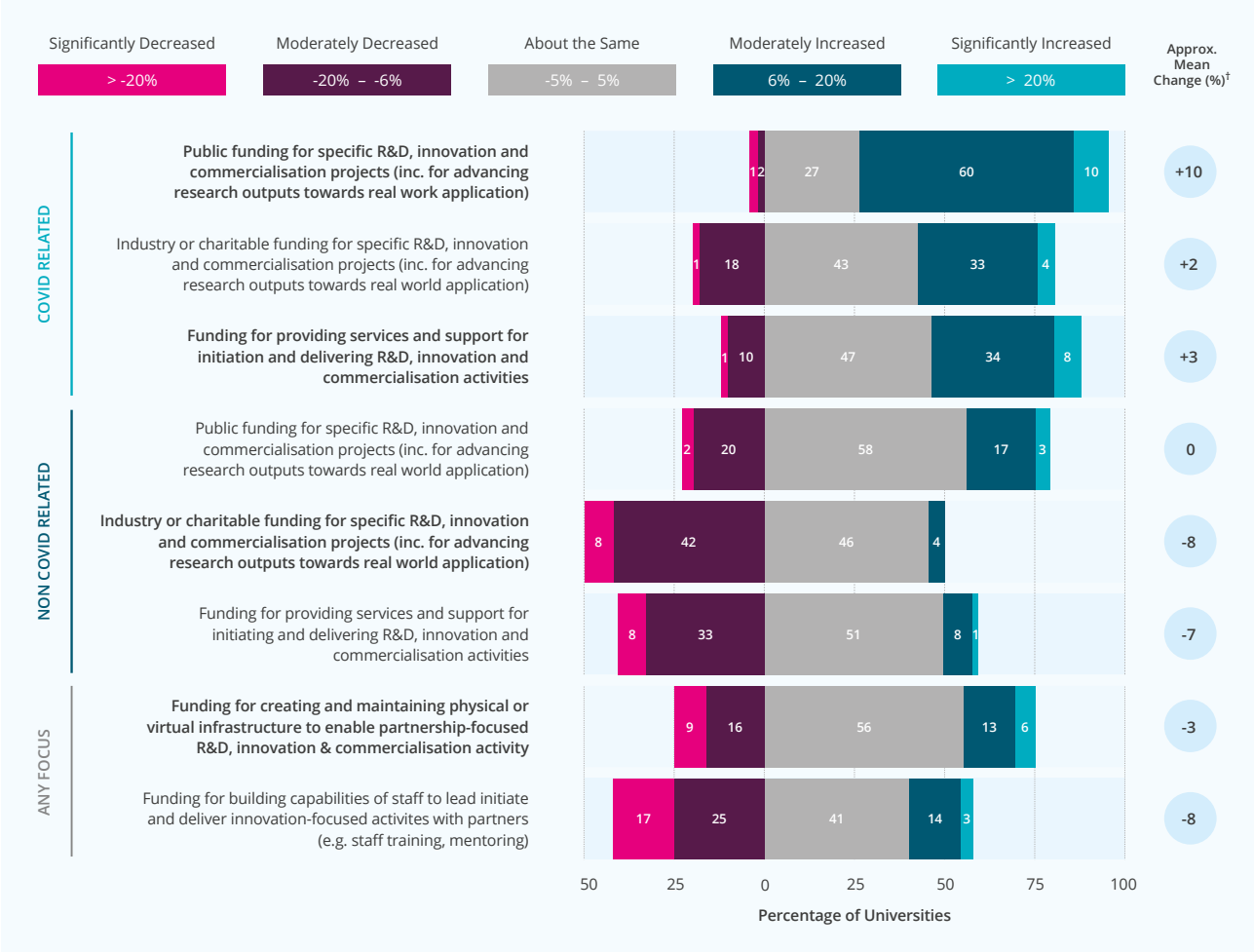
The survey then probed how the Lockdown had affected a university's ability to initiate new projects with external partners. Securing and initiating projects and collaborations requires a wide range of activities to take place and resources to secure, and can benefit from active support from the university for developing and setting up projects. Figure 13 presents the results. It shows that universities, to get new projects off the ground, found it significantly harder to enable

access to the necessary facilities, equipment and raw materials (including data), and to assemble and/or recruit the necessary staff to deliver project activities. Many (54%) also found it at least moderately harder to agree and secure the necessary funding and commitments, while 45% of universities found it harder to identify and make the initial approach to potential partners for collaborations or projects. Forty-four percent of universities found it harder to develop the initial working relationship with partners although 22% said they found it easier to do so. The ability to agree terms of engagement and provide sufficient partnership support to get projects off the ground was less affected than other factors.

5.7 Level of funding available to initiate, support and deliver innovation-focused activities

R&D, commercialisation, and innovation-focused projects universities undertake with and for external partners are directly funded by a multitude of public, private and charitable sources. Further, initiating and delivering this type of activity is underpinned by a system of knowledge exchange support that requires adequate resourcing, as does the building of capabilities of those staff involved. These projects are also enabled by the physical and virtual infrastructure within which they take place. The survey explored how the pandemic and Lockdown period has affected the availability of funding within universities to allocate to these different areas: to projects; support; infrastructure; and capability building. Importantly it distinguished between funding for COVID-19 related projects and non-COVID projects. This recognised anecdotal evidence that much of any new activity was focused on addressing the many and varied challenges around tackling the health and socio-economic crises caused by COVID-19. Figure 14 presents the results. From the individual responses we estimate the approximate mean percentage change in each type of funding available.

Figure 14 **Effect of Lockdown on the level of funding available to initiate, support and deliver innovation-focused activities for external partners**



†: Mean change estimated by taking the following points in each category: Collapsed (-51%); significantly decreased (-35%); moderately decreased (-13%); about the same (0%); moderately increased (13%); significantly increased (21%).

The survey shows that while funding availability within universities for COVID-19-related projects and support went up during Lockdown, funding for other types of R&D, innovation and commercialisation projects decreased for many. Further, while public funding for non-COVID-19 projects was largely unaffected for many (58%) and only decreased for 22% of universities, project funding from industry and charitable sources at least moderately decreased for 50% of universities.

When looking at the services and support provided by universities to initiate and deliver projects and activities, 41% of universities reported a decrease in the availability of this type of resource within their institutions for non-COVID-19 projects. This contrasts with 42% of universities that report an increase in the availability of such funding to initiate and support COVID-19 projects. Seventeen percent of universities also reported significant decreases (more than 20%) in the availability of funding within their institutions to support the building of capabilities of staff to engage in such projects. No statistically significant variation was seen in the results across the different KEF clusters.

These results are perhaps unsurprising given the urgent need for universities to utilise their immense resources and expertise to help find solutions to COVID-19 health and wider socio-economic problems. However, it raises important questions about how the university system adapts and reconfigures as we transition beyond the pandemic and the resources available from private and charitable partners, as well as the public sector within different types of universities to support and develop R&D, innovation and commercialisation-related activities.

Summary of key findings

Level of activity with key sectors: There is a clear correlation between the scale of change in the economic output of individual sectors and the change in the levels of innovation-focused activities with universities. The biggest declines in activities with universities were observed in sectors such as aerospace and automotive manufacturing, the creative industries and media, and with non-biotechnology scientific and technical services. By contrast, on average activities increased with strategic partners, and with pharmaceutical manufacturing and medical biotechnology sector, with agriculture, fishing and forestry, and with human health and social work).

Level of activity with different types of partners: There is also evidence that many universities' innovation-focused activities with SMEs have been badly affected by the pandemic.

The results do highlight the value of building long term strategic partnerships with firms and others. Activities with these types of partners were much less affected and in many cases actually increased during the pandemic. These partners were also more likely to invest time and effort in maintaining relationships while funding may be depressed.

Nature of changes to projects: During Lockdown universities were more likely to have experienced delays and postponements of work, and attempts at renegotiating terms and conditions, rather than outright cancellations of projects. It raises important questions of how long the reduced or postponed activities can be sustained if the finances of partners do not improve.

Challenges in initiating and delivering projects: The main challenges facing universities in delivering existing projects and in initiating new partnerships centre on their ability to ensure access to necessary facilities, equipment and raw materials (including data), and the ability of staff to dedicate sufficient time to project tasks. Covering financial costs of existing activities, and securing funding for new projects were also frequently cited as a key challenge.

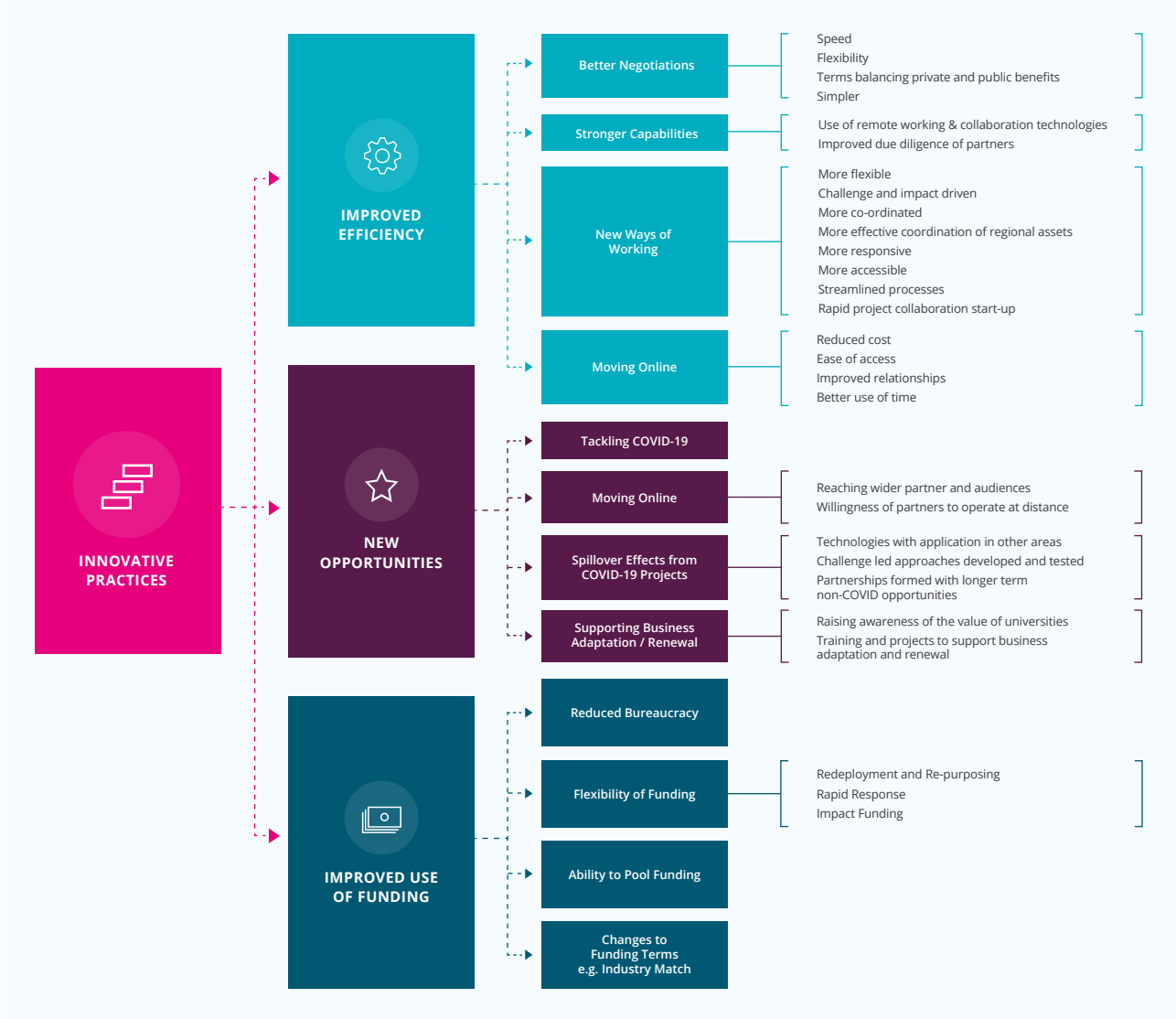
Availability of funding: While public funding for R&D, innovation and commercialisation projects – COVID and non-COVID-related was largely unaffected, or even increased, during Lockdown, funding availability from industry and charitable sources for non-COVID-related projects decreased for many. Further, many universities reported a decreased availability of funding for providing the services and support to initiate and deliver non-COVID-related projects, and for building capabilities of staff to lead and deliver such projects.

06 INNOVATIVE PROCESSES, BEHAVIOURS AND APPROACHES DEVELOPED DURING LOCKDOWN

The locking down of the economy and society to address the COVID-19 health crisis meant universities had to find new ways of working to sustain as much innovation-focused activity with partners as possible.

Confronted with these major challenges, universities worked to find new ways of working and engaging with partners. And while the pace of work established in the rush to develop solutions to Covid-19 health challenges cannot be sustained longer-term, the universities responding to the survey believed a range of innovative new processes, behaviours and approaches could be made permanent to improve the effectiveness and value of their innovation engagements beyond the pandemic. These are captured in Figure 15.

Figure 15 **Map of areas of innovative practices**



6.1 Improved efficiency and effectiveness

The urgent need to adapt to the disruptive new COVID-19 working landscape has led to a number of practices and approaches that universities believe could improve the overall efficiency and effectiveness of their innovation-focused engagements beyond the pandemic. Developments have been made in a number of areas that they would like to see sustained.

6.1.1 The move online

Perhaps the most visible change to our working lives has been the shift to remote working. Many universities rapidly transitioned existing projects and activities online and to virtual collaborations. This transition required the rapid roll-out of new virtual learning environments and collaboration and networking tools. While the initial perception was that online delivery of, for example, events and training, would be less efficient and effective than face-to-face, many quickly realised that there could be significant benefits that could outweigh the disadvantages.

The move online helped to reduce the cost of delivering certain types of events and training, making it more accessible to certain types of partners. Further, universities talked about the benefits of staff not having to travel to meetings and workshops leading to a more efficient use of time and the ability to attend a higher number of meetings than would otherwise be possible through face-to-face alone.

The shift of many meetings, events and workshops online also made it easier for university staff to participate further afield geographically where previously they would have not attended due to the travel difficulties and time constraints. This was particularly noted by universities located far outside London in their ability to engage more effectively with key decision-makers (e.g. in policy) located in the UK's capital.

Some of the universities responding to the survey also reported benefits to their working relationships with partners as they transitioned their projects and activities from physical to virtual modes of engagement. As staff were forced to very rapidly adopt and learn to use online collaboration tools – some of which have been standard in some companies for a number of years – partners found that the quality of their interactions actually increased compared to previously when interactions were dominated by intermittent face-to-face meetings and email and telephone communications.

Overall, while there are obviously drawbacks from online provision of some types of activities, not least from the less favourable conditions for social and professional networking, as we move beyond the pandemic we should consider how to maximise the benefits of greater online provision alongside face-to-face provision, perhaps through more blended virtual-physical activities.

6.1.2 New ways of working

The rapid pressures on universities in March 2020 to transition to remote working while simultaneously working to solve the many and varied health and local socio-economic challenges created by the COVID-19 pandemic led to staff innovating in the ways in which they work with external partners.

The universities responding variously provided examples of the following:

+ **Becoming more flexible, agile and responsive** – finding ways of enabling teams to quickly assemble and redeploy resources to rapidly address emerging challenges.
+ **Becoming more accessible** – through much greater use of digital technologies, and through the reconfiguration of KE portfolios, universities became more accessible to partners who previously may not have engaged; either because they were located too far away, or because they couldn't see the relevance to their organisations.
+ **Becoming more coordinated** – the greater use of virtual collaboration tools resulted in stronger coordination and more coherent internal services to support academics in engaging rapidly with external partners.

- **Becoming more challenge- and impact-driven** – for example working closely with external partners to identify specific innovation challenges and developing ways of translating these into practical action plans, projects and activities; and requiring proof of concept projects to involve external partnerships in order to qualify for internal funding.
- **Working more closely with regional assets** – collaborations with local hospitals and other regional groups to address local health and economic challenges revealed what is possible when local groups work together to achieve common goals. These have led to new opportunities for longer term engagements.
- **Experimenting with different ways of translating IP into practice** – for example around how to use social venturing to commercialising technology-based IP for the public good.
- **Leveraging digital technologies to enable rapid starts to collaborations** – for example through use of digital signatures, video conferences and electronic documents/forms, and calls for fast-start mechanisms to get collaborations off the ground quickly need to be embedded longer term.

6.1.3 Better negotiations

The urgency of finding solutions to COVID-19 health challenges meant that universities and their partners had to come together and get collaborative and commercialisation projects up and running very quickly.

> Trust and a collective vision enabled partners to get projects up and running very quickly while the finer legal details were ironed out.

Respondents to the survey highlighted that they were able to do so because of the commitment and flexibility on both sides of the negotiating table to finding practical solutions to common sticking points. This was aided critically by the partners having a shared vision to come together rapidly to solve particular COVID challenges. Objectives and the broad terms of engagement were negotiated and agreed at great speed. Trust and a collective vision enabled partners to get projects up and running very quickly while the finer legal details were ironed out.

Within universities, examples also emerged of staff finding ways to become much more agile to deal with contracting issues, and of coordinating internal processes more effectively to meet the urgent and tight delivery timescales. The adoption of digital technologies, including e-signatures in particular, enabled contracts to be signed much more quickly and flexibly than previously.

Examples were provided of universities rolling out simple 'click-through' licensing agreements for certain types of IP which they would like to see expanded, where appropriate, post-pandemic. Others emphasized the increased flexibility of partners to balance private benefit with public good when negotiating contract terms.

Overall, there were calls for the learnings from the dramatically increased speed and flexibility of negotiations and contracting – from all sides of the negotiation – established to respond to the pandemic, to be preserved beyond it.

6.1.4 Stronger capabilities

The Lockdown meant most university staff had to switch to remote working and find new ways of delivering projects and engaging with partners. In particular, many staff were confronted with having to adopt new digital communication and collaboration tools and build capabilities to use them effectively. What some university respondents witnessed was a general strengthening of the overall capability of staff to engage collaboratively and virtually, which has benefited their partnerships with companies and others. Others reported that the move online made it easier to perform due diligence on potential partners leading to more suitable partners being selected.

6.2 New opportunities

While the economic effects of the COVID-19 pandemic have been hugely damaging with many R&D and innovation activities disrupted, opportunities for new partnerships and innovation-focused activities have emerged. The responses to our survey can broadly be categorised into opportunities arising from (i) tackling the immediate COVID-19 health crisis; (ii) supporting business resilience, adaptation and renewal; (iii) shifting services online; (iv) spillovers from COVID-19 projects.

6.2.1 Tackling the immediate COVID-19 health crisis

Perhaps the most publicly visible set of innovation-focused opportunities for universities centre on their immediate and rapid response to developing a wide range of projects and activities to find practical solutions to the immediate health crisis. This includes areas ranging from vaccines and therapeutics, COVID-19 diagnostic tools, ventilators and breathing aids, symptom-tracking and real-time pandemic monitoring and surveillance tools; to data analytics, predictive modelling and the provision of expert advice to support national and local health authorities and policy development; to the development of insights and understanding of the wider effects of the pandemic on mental health and well-being, cultural institutions, economic activity across sectors to name but a few area. Many specific examples are provided in section 2.1, in publications such as the NCUB Collaboration in Crisis (NCUB, 2020) and in the public media.

6.2.2 Supporting local business resilience, adaptation and renewal

In addition to the health response, many universities also pivoted their capabilities and KE services to find ways of supporting businesses – often SMEs in their local economies – as they looked to deal with the significant disruptions to their operations. Examples were provided in the survey of universities developing new, or scaling up existing, initiatives to help companies: finding new markets and business opportunities; innovate in their products and services; adopting new technologies and developing processes to drive efficiency improvements; adapting to new ways of working and become more agile; and accessing new funding and investment opportunities.

6.2.3 Spillovers from COVID-19 projects

As is often the case in the building of relationships between universities and external partners to drive innovation, initial projects and activities can lead to opportunities for longer term engagement. Many of the universities responding to the survey provided examples of such spillovers from the projects and partnerships set up as part of the immediate response to the unfolding health and socio-economic crises.

In particular they highlighted how:

- Production, process and enabling technologies developed to fight the COVID-19 health crisis are finding applications in other areas.
- Approaches to partnership - and project-development, and to technology commercialisation developed to rapidly address COVID-19 challenges are proving useful more widely across universities as ways to approach challenge-driven research, translation and commercialisation.
- Many partnerships formed in the heat of the moment to tackle specific COVID-19 challenges – for example with local hospitals and local health authorities, with central government agencies and departments, and with companies to commercialise technologies – have led to emerging opportunities for much longer term engagements beyond the pandemic.

6.2.4 Moving online

The move of many workshops, training and other knowledge exchange services online has, for some universities, led to new opportunities for valuable engagements with firms and other organisations. Many of the university respondents noted how they were able to engage with participants much further afield than previously when interactions largely required to be in-person, which for some presented significant cost and time barriers.

Universities located far outside London, for example in the North of England) specifically noted how they were able to participate much more actively in activities that were previously London-centric.

Examples were provided of universities becoming more flexible in the provision of services and support to companies as a result of the move online, and as a result they had become more responsive and accessible to industry needs. A number of respondents also highlighted the move online, coupled with the pivoting of their KE portfolio has helped them reach further into the SME-base of the economy. One university respondent also believed the switch online could help to address historical equality and diversity-related barriers and challenges for engagement.

6.3 Improved use of funding

Many of the universities responding to the survey highlighted how changes made by some funders helped them to become more flexible and responsive as they sought to rapidly set up new projects and partnerships to help find solutions to the many and varied COVID-19 health and wider socio-economic challenges.

In particular they variously highlighted the following:

- **Reduced grant-related administration and bureaucracy** resulted in greater agility to respond to new opportunities.
- **More flexibility in the use of research, translational and KE funding** allowed for the rapid redeployment and repurposing of resources.
- **The ability to pool different funding sources** enabled them to create more flexible, impact-driven funding that could invest along the research translation and commercialisation process and more effectively invest in challenge-driven collaborations.
- **Changes to match-fund requirements** by some funders reflected the reality that in some sectors companies will find it very difficult to invest financially in projects with universities.

Summary of key findings

Universities responded to the challenges of Lockdown by developing new ways of working and engaging with partners to support their innovation activities and objectives. Those responding to the survey wanted to see a number of these new processes, behaviours and approaches sustained beyond the pandemic. In particular developments were believed to have resulted in:

- Improved efficiency & effectiveness through moving certain types of activities online, finding new ways of working, building stronger digital and collaboration capabilities, and improving the speed and flexibility of negotiations.
- New opportunities for productive and valuable interactions and partnerships beyond the immediate projects to address COVID-19 challenges. For example moving certain activities online opened up new opportunities and access to a broader range of partners; some of the technologies, processes and approaches developed as part of the COVID response are now finding applications elsewhere; and longer term opportunities for valuable engagement are now emerging from the partnerships formed with the local health system, businesses and the community as part of the COVID-response.
- Improved use of funding, for example through reduced bureaucracy and grant administration requirements during the pandemic, increased flexibility in how grants could be used, the ability to pool funding to deliver more impact- and challenge-focused projects, and changes to funding terms around industry match requirements making it easier for partners to engage despite significant financial pressures.

07 EXPECTED CHANGES OVER THE SHORT TERM TO MARCH 2021

Despite the significant uncertainties in how the COVID-19 pandemic and the associated economic crisis will evolve in the future, universities, firms, charities, and public funders have to make plans for how to allocate their resources over the short-to-medium term to deliver on their objectives. It is therefore instructive to examine the expectations of universities – in August/September 2020 – of how the level of innovation-focused activity with external partners, and of funding availability to support such activities will change between September 2020 and March 2021. This section presents the results.

7.1 Expected changes to the level of innovation activities

Table 9 presents the survey findings on the expectations of universities on how the level of innovation-focused activities with external partnerships will change between the end of Lockdown and March 2021. It compares this with the changes experienced during the Lockdown. Just over half of UK universities believed this type of activity would increase at least moderately in the short term, while 28% believed it would decrease. This results in an approximate mean change of 3%. This compares to a decline of 6% during Lockdown, with 45% of universities having witnessed at least a moderate decrease in activity and just 23% seeing increases.

Table 9 **Comparing the change in the level of innovation-focused activity between universities and external partners during Lockdown with future expectations (to March 2021)**

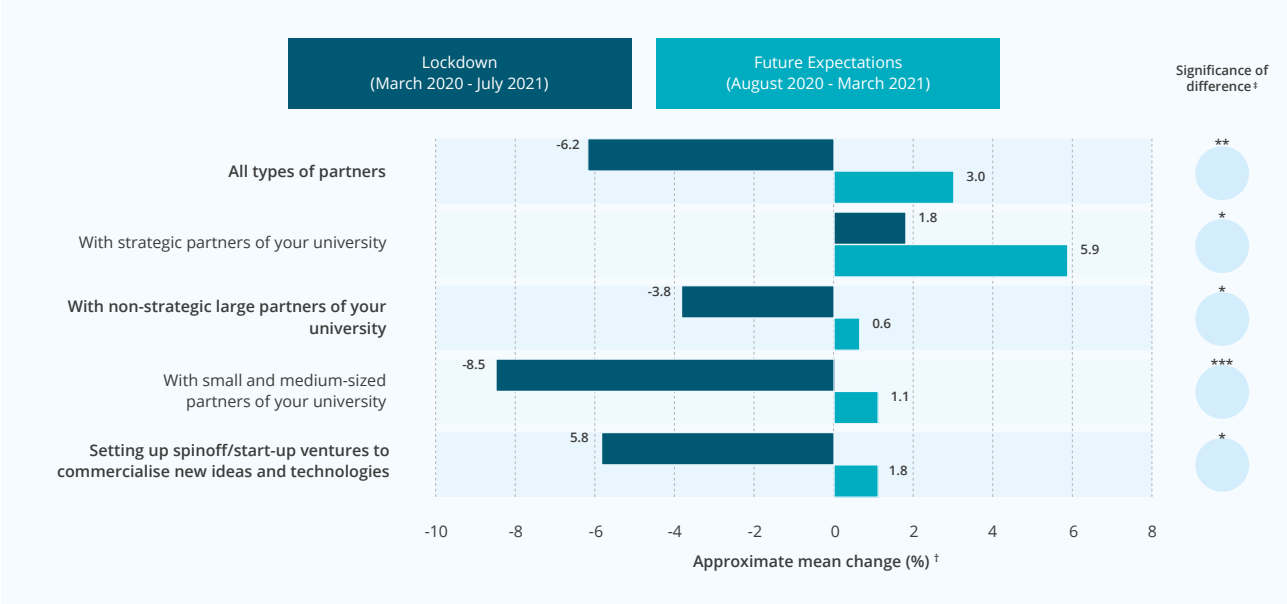
Period	Proportion of universities citing change category (%) (weighted sample)					Approximate mean change (%)†
	Collapsed / significantly decrease (more than 20%)	Moderately decrease (-6% to -20%)	About the same (-5% to 5%)	Moderately increase (6% to 20%)	Significantly increase (more than 20%)	
Lockdown (March – July 2020)	15	30	32	20	3	-6.2
Short term future (to March 2021)	3	25	21	45	6	3.0

†: Mean change estimated by taking the following points in each category: Collapse (-51%); significantly decrease (-35%); moderately decrease (-13%); about the same (0%); moderately increase (13%); significantly increase (21%).

Lockdown response is statistically different from short term future response at the 5% level (p = 0.012) based on the paired sample Wilcoxon signed rank test.

Looking at expectations in the change in activity with different types of partners (Figure 16), activities with strategic partners are expected to rebound most with an approximate mean change between Lockdown and March 2021 of just under 6%. By comparison growth in activity with non-strategic large partners of universities is expected to be just above zero (up from a 3.8% decline during Lockdown). Work with SMEs is expected to increase by 1.1% to March 2021 compared with the 8.5% drop during Lockdown.

Figure 16 **Comparing the approximate mean change† in the level of innovation-focused activities with different types of external partners during Lockdown with future expectations (to March 2021)**



†: Mean change estimated by taking the following points in each category: Collapse (-51%); significantly decrease (-35%); moderately decrease (-13%); about the same (0%); moderately increase (13%); significantly increase (21%)

‡ Statistical difference based on the paired samples Wilcoxon signed rank test

Overall, it is clear from the results that, on average, universities do not expect the level of activity with non-strategic partners, large and small, to recover from the substantial declines experienced during Lockdowns in any meaningful way in the short term. At the individual university level (Table 10) 36% of universities expect to see the level of activities with external partners to be higher in March 2021 than pre-pandemic (43% lower). This rises to 51% of respondents when we focus on activities with strategic partners (versus 21% who believe activity will be lower). By contrast 40% of universities believe activity with non-strategic large partners will be lower by March 2021 (26% higher) and 46% believe that activity with SMEs will be lower (32% higher). Once again the evidence highlights the long term benefits derived from forming strategic partnerships with external partners.

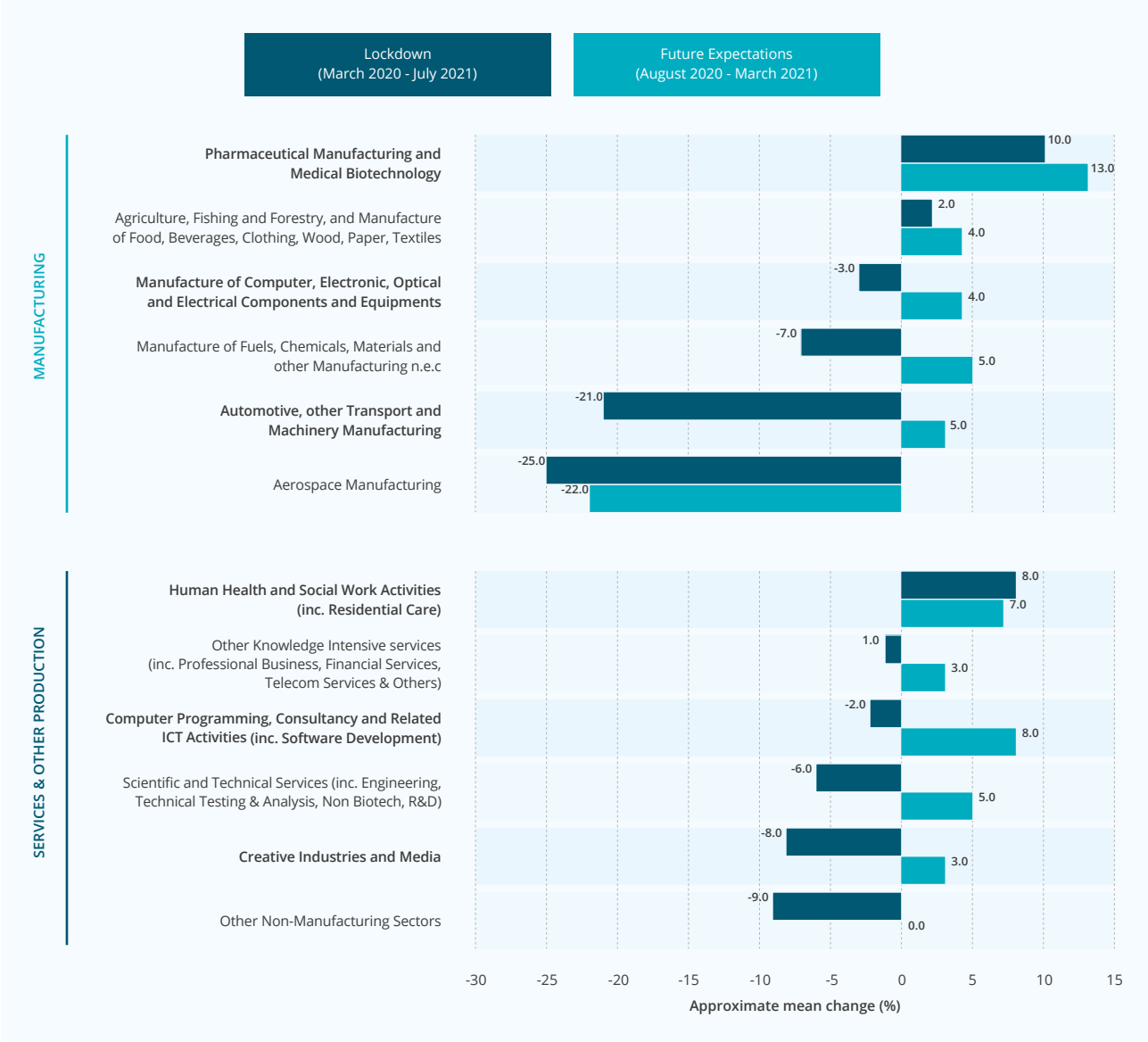
Table 10 **Overall change between pre-Lockdown and March 2021 (unweighted sample)**

Type of partner	Overall change (pre-Lockdown – March 2021)† (% respondents in each category, unweighted)				
	Significant decline	Moderate decline	About the same	Moderate increase	Significant increase
With **strategic partners** of your university	18	4	28	23	28
With **non-strategic large partners** of your university	28	11	34	13	13
With **small and medium-sized partners** of your university	35	11	23	14	18
Setting up spinoff/start-up ventures to commercialise new ideas and technologies	22	17	30	17	13
With **all types of partners** of your university	29	14	21	21	16

† Overall change looks at the individual response level and calculates whether a given university will experience an overall increase of decrease in the level of innovation-focused activity taking account of the change during in Lockdown and the expected future change to March 2021.

Expected change by sector is presented in Figure 17. It shows that, on average, universities expect activity by March 2021 across most sectors to improve, compared with Lockdown. The main exception is aerospace manufacturing where universities expect to continue to see significant declines. Unsurprisingly key areas of strong expected growth are with partners in the pharmaceutical manufacturing and medical biotechnology sectors and in human health and social work services. In addition, strong growth is expected with computer programming, consultancy and related ICT firms.

Figure 17 **Comparing the approximate mean change† in the level of universities' innovation-focused activities with external partners in key sectors during Lockdown with future expectations (to March 2021)**

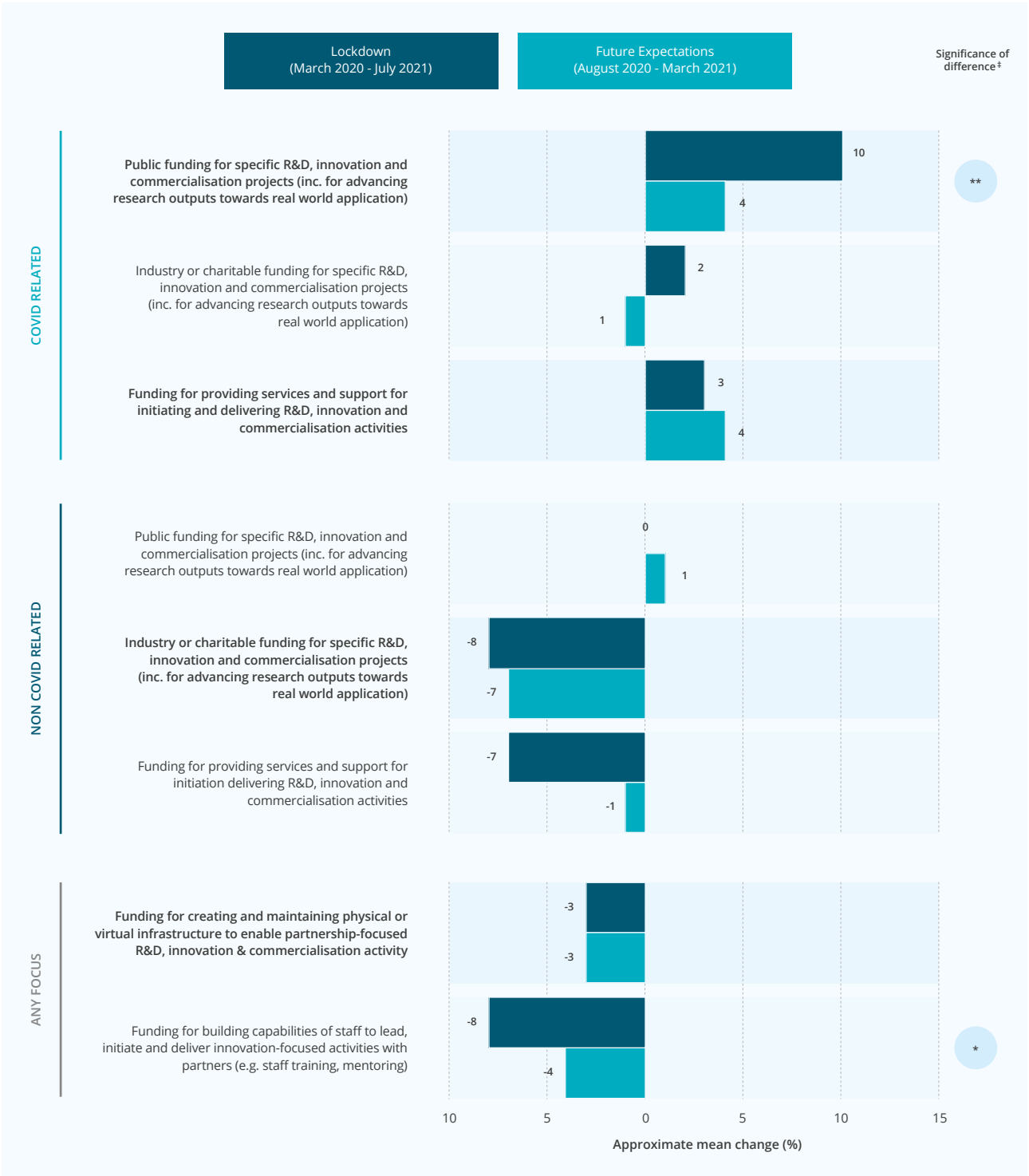


7.2 Expected changes in funding availability

While many universities expect innovation-focused activities to bounce back to some extent in the short term compared with Lockdown (Table 9), there appears to be more concerns about funding availability moving forward (Figure 18). As the immediate health crisis (hopefully) begins to come under control, universities expect the increased availability of public funding for COVID-related projects to begin to slow, while industry funding for such projects is expected to decrease slightly (although the change with Lockdown is not statistically significant).
For non-COVID projects, public funding is expected to remain approximately the same, while industry funding is

expected to continue to decrease quite substantially to March 2021. Universities are expecting the decreases in funding availability for providing services and support to non-COVID projects during Lockdown to stabilise (although this difference is not statistically significant at the 10% level). Funding availability to create and maintain the physical and virtual infrastructures to enable partnerships and innovation-focused activities, and for the building of staff capabilities, is expected to continue to decrease in the short term.

Figure 18 **Comparing the change in the level of funding available within universities to initiate, support and deliver innovation activities and projects with external partners during Lockdown with future expectations (to March 2021)**



‡ Statistical difference based on the paired samples Wilcoxon signed rank test.

Summary of key findings

Expected change in the levels of activities: As universities looked to the future in September 2020 they, on average, expect to see a moderate bounce back in the level of innovation-focused activities with external partners, although not enough to make up for the decreases experienced during the Lockdown. Overall, just a third of the universities responding to the survey expect to see levels of innovation-focused activities higher in March 2021 than pre-pandemic. Activities with strategic partners look much more positive, with universities, on average, expected to see growth in the level of activities accelerating as we transition from the immediate health crisis into the economic recovery.

Expected change in funding availability: While many universities expect to see some degree of bounce back in the level of innovation-focused activities with external partners, there are concerns about whether the level of funding available to fund projects and support will do so. As we move into the early phase of the economic recovery, universities expect the level of available funding for COVID-related projects to grow less rapidly than during the initial phase of the pandemic. Further, they expect to see little change in the levels of public funding for non-COVID-related projects and continued, significant decreases in industry and charitable funding. These trends raise important questions of whether, and how, universities will be able to play a full and active role in the economic recovery and renewal phase.

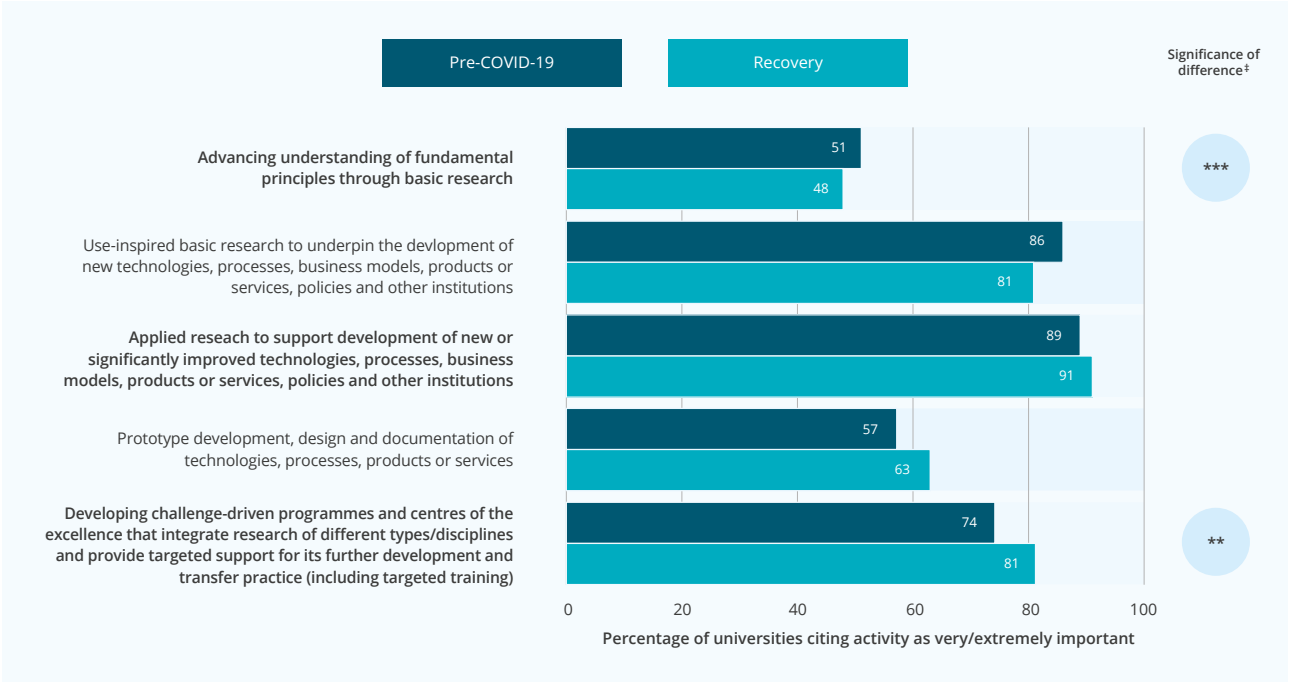
08 THE ROLE OF UNIVERSITIES IN THE ECONOMIC RECOVERY

Universities have the potential to play a crucial role in helping to drive an innovation-driven economic recovery and renewal, both at the nation-level as well as within their local economies. This section examines whether senior university leaders see a change in the balance of importance their universities place on different types of innovation-focused activities compared with the status quo pre-pandemic (section 4). Each chart presents the level of importance attached to each activity pre-pandemic (over the three years to March 2020) and expectations during the national economic recovery. The statistical significance of any differences are tested using the Wilcoxon signed rank test.

8.1 R&D activities

Overall, universities expect only modest shifts in the balance of importance attached to the different R&D activities as we move into the economic recovery (Figure 19). There is a small yet statistically significant decrease in the proportion of universities citing basic research as either very or extremely important. There is also a decrease (albeit not statistically significant) in the importance of use-inspired basic research. By contrast, the importance attached to challenge-driven programmes and centres of excellence that integrate research and targeted support for its further development and transfer into practice increases to 81% of universities from 74% pre-pandemic. Further, there is some increase (although not statistically significant) in the proportion of universities citing R&D to drive prototype development, design and demonstration as very or extremely important.

Figure 19 **Comparing the importance placed by universities on innovation-focused R&D activities pre-Covid with expected importance for the economic recovery**

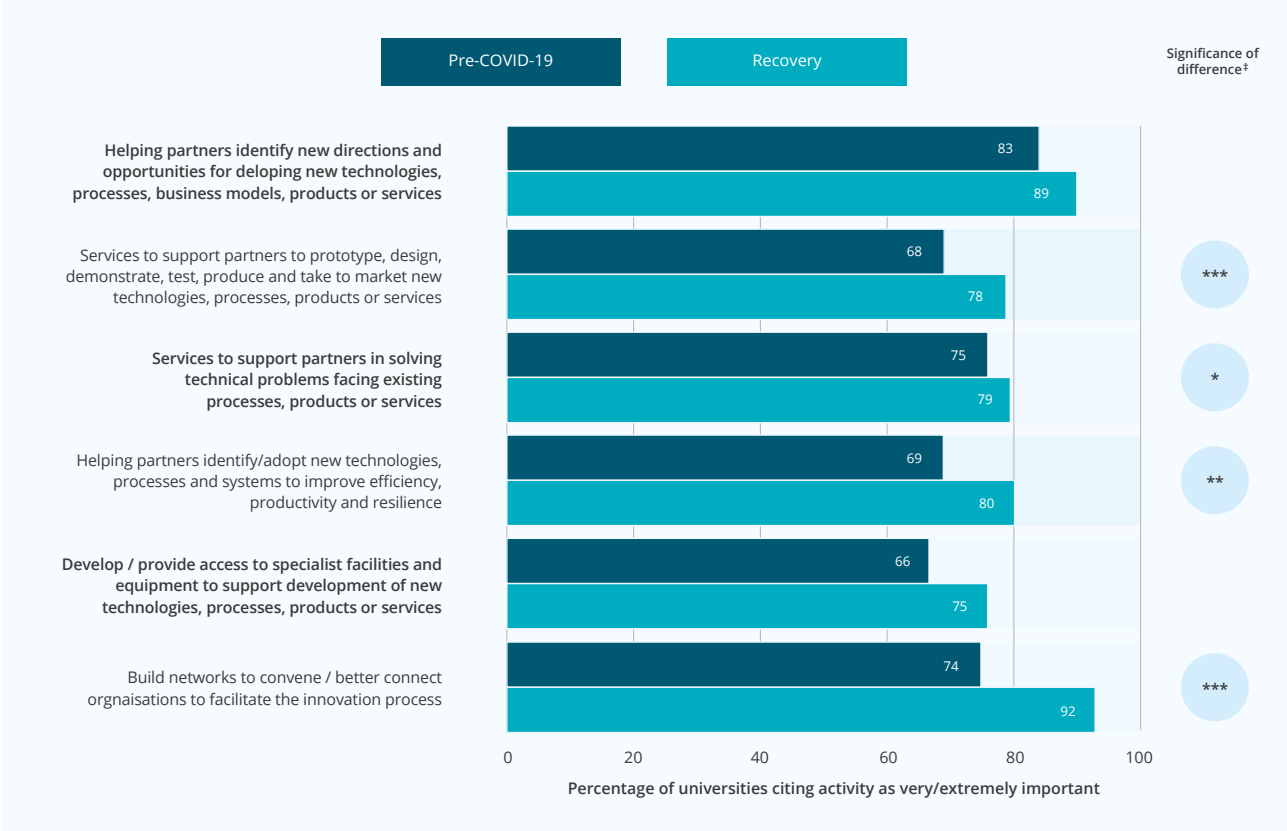


‡ Statistical difference based on the paired samples Wilcoxon signed rank test.

8.2 Innovation-focused services and support beyond R&D

Much bigger changes are expected in the importance attached to innovation-services and support universities provide beyond R&D (Figure 20). The survey found that many universities continue to view these activities as very or extremely important for their institutions in the national economic recovery. Overall, the results point to an increased importance in helping partners realise value from their ideas and inventions, and helping them to improve their productivity; areas that will be critical for firm survival through the economic crisis. In particular, areas where university leaders perceive significant increases in importance include: non-R&D services to support partners to prototype, design, demonstrate, test, produce and take to market new processes, products and services; helping partners to identify and adopt new technologies, processes and systems to improve efficiency, productivity and resilience; and in building networks to convene and better connect organisations to facilitate the innovation process.

Figure 20 **Comparing the importance placed by universities on innovation-focused services and support (beyond R&D) in delivering partners' innovation objectives pre-Covid with expected importance for the economic recovery**



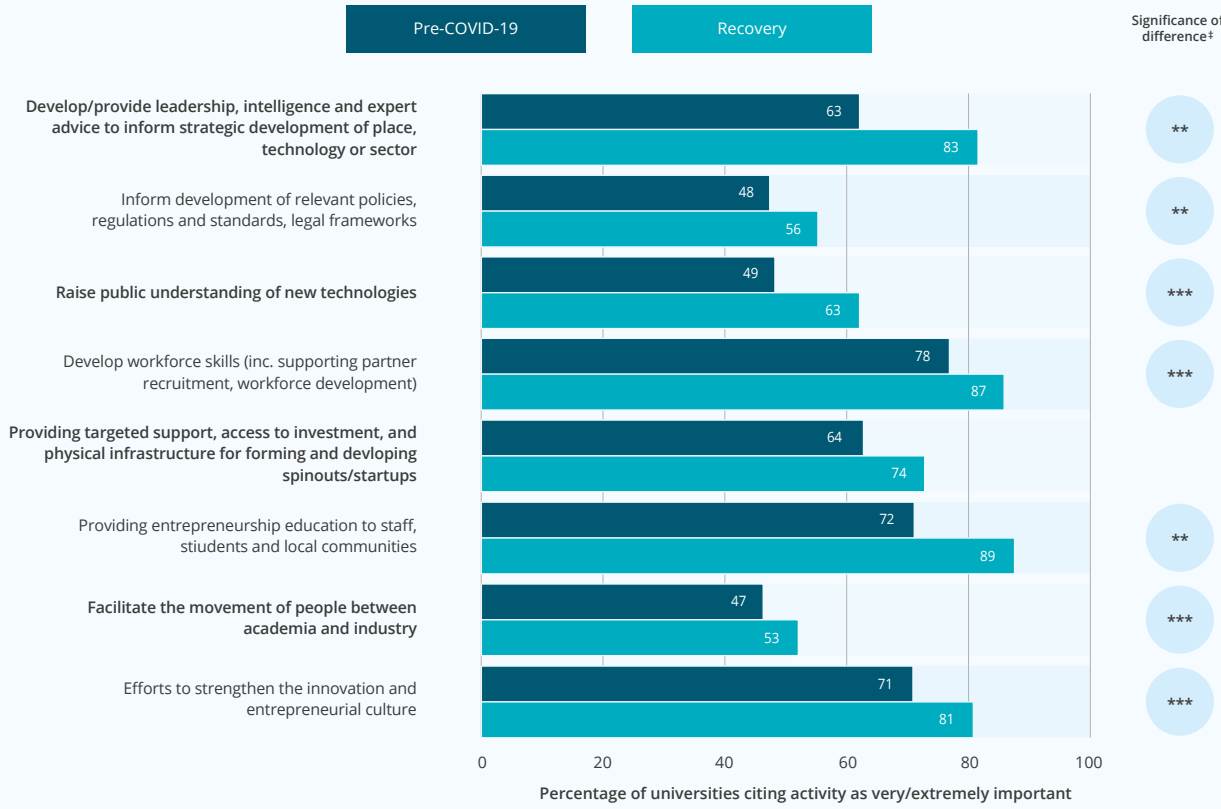
‡ Statistical difference based on the paired samples Wilcoxon signed rank test.

8.3 Services and support for enabling the development and diffusion of innovations

Many university leaders also expected the importance of a wide range of services and support to strengthen the underlying system which enables innovation to take place to increase during the economic recovery. In particular 83% of university leaders view developing or providing leadership, intelligence and expert advice to inform the strategic development of places, sectors or technologies as very or extremely important, up from 63% pre-pandemic. Almost nine-in-ten universities view the provision of entrepreneurship education to staff, students and local communities as very or extremely important during the economic recovery, up from 72% pre-pandemic, and 81% cite efforts to strengthen the innovation and entrepreneurial culture of the innovation system as similarly important (up from 71% pre-pandemic). Further, more universities see developing workforce skills (for example through supporting partner recruitment and workforce development), and raising the public understanding of technologies as very or extremely important activities for their institutions during the economic recovery compared with pre-COVID.

Figure 21

Comparing the importance placed by universities on innovation system strengthening services and support pre-Covid with expected importance for the economic recovery



‡ Statistical difference based on the paired samples Wilcoxon signed rank test.

Summary of key findings

As the political, social, economic and industrial landscapes shift dramatically as a result of the pandemic universities are having to reflect on how they can best contribute to economic recovery and renewal of a nation, of key sectors, and of their local economies and communities. The survey suggests that only small shifts in the balance of different types of R&D, likely reflecting universities' core long-term competences that underpin their long-term impacts. One key development is the expected growth in importance of challenge-driven programmes that integrate not just research but also its translation into applications.

Much bigger changes are expected in the innovation-services and support universities provide beyond R&D. In particular universities expect to place greater importance on supporting partners in later stages of innovation process (e.g. prototyping and technology demonstration) and in helping them to identify and adopt new technologies, processes and systems to drive efficiency and productivity improvements. Many university leaders also expected the importance of a wide range of services and support to strengthen the underlying system which enables innovation to take place to increase during the economic recovery, including around the provision of leadership and intelligence to support strategic development of places and sectors, and in the building of skills and innovation and entrepreneurial culture and capabilities.

09 GOVERNMENT SUPPORT DURING THE PANDEMIC AND BEYOND

The UK Government – like many governments of advanced economies around the world – was forced to intervene in an unprecedented manner in the economy to support jobs and livelihoods while vast swathes of the economy was effectively shuttered to combat the spread of the virus. It created a number of schemes to support amongst others the employed, self-employed, innovative businesses and SMEs. Research and innovation funding agencies also responded by adapting or scaling funding programmes to make it easier for organisations to extend their activities to deal with immediate Lockdown challenges, adapt and redeploy resources to tackle COVID-19 challenges, and provide new research and innovation funding opportunities in key areas.

This final section explores what effects various UK government schemes and funding programmes have had on the ability of universities to continue to engage in innovation-focused activities and projects through the Lockdown and into the economic recovery period. It presents views from universities on where further government action could be taken or strengthened to ensure that universities are able to play an active and strategic role in helping to drive both national and local innovation-focused economic recoveries.

9.1 The effect of government support schemes on university innovation activities

The survey explored university perceptions of the effects of selected UK Government schemes and UKRI funding programmes on their ability to initiate, support and deliver innovation-focused activities and projects through the Lockdown period and into the early stages of the economic recovery. On the 'demand side' for innovation-focused knowledge exchange, it looked at the general Coronavirus Job Retention scheme (supporting employers by covering part of the wages of staff placed on furlough) and the suite of schemes put in place to support innovative businesses (such as the New Future Fund, grants/loans for SMEs focusing on R&D, Innovate UK Sustainable Innovation Fund). The job retention scheme could also be used by universities.

On the 'supply side' the survey looked at UKRI's new rapid response calls for COVID-19 research, UKRI's changes to grants enabling recipients to re-purpose them to address COVID-19 challenges; and UKRI's grant extension allocations which aimed to provide organisations with resources to sustain UKRI funded research and fellowships (and support for technical and research infrastructures) through the pandemic. Finally, it explored two funding programmes dedicated to supporting knowledge exchange and translation and commercialisation of research outputs (the Higher Education Innovation Fund[7] and the Research Council's Impact Acceleration Account (IAA) funding).

Figure 22 presents the results. It shows that all of the programmes investigated had, on average, a mean positive score. Perhaps unsurprisingly, universities viewed those funding programmes that directly supported the functioning of the university-innovation interface and the active translation and commercialisation of research as having the greatest effects on their ability to continue to initiate and deliver innovation-focused activities and projects. Forty-one percent of English universities in receipt of HEIF funding claimed it had significantly positive effects (and a further 35% claimed slightly positive effects); and 35% of universities in receipt of IAA funding claimed significantly positive effects (and a further 28% claimed slightly positive effects).

7 Available to qualifying English Higher Education Institutions only.

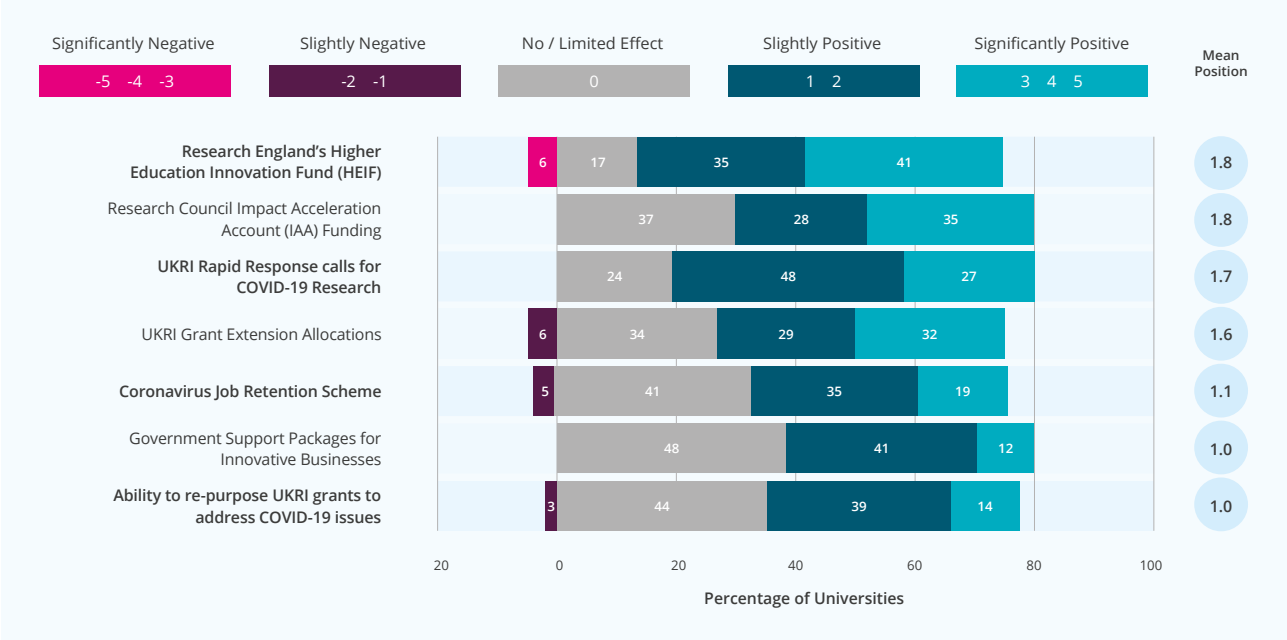
75%
UKRI'S RAPID RESPONSE CALLS FOR COVID RESEARCH

53%
GOVERNMENT SUPPORT PACKAGES FOR INNOVATIVE BUSINESSES

76%
RESEARCH ENGLAND'S HEIF FUNDING

Around three-quarters of universities claimed the UK rapid response calls for COVID-19 research had had a positive effect, and 61% cited positive effects from the UKRI grant extension allocations. Just over half of universities claimed that the job retention scheme and the various support packages for innovative businesses had positive effects on their ability to initiate, support and deliver their innovation-focused activities and projects through Lockdown. There were few statistically significant differences between types of universities (by KEF Cluster) (Table 11). Most differences would appear to be driven by the access to, and scale of funding received by different types of universities, with research intensive universities in clusters V and X much more likely to see changes to UKRI grants as positive compared with those in clusters E and JM.

Figure 22 **Effect of selected government schemes on the ability of universities to initiate, support and deliver innovation-focused activities and projects through Lockdown and into the early stages of the economic recovery**



* Available to qualifying English Higher Education Institutions only and awarded by formula. Unweighted base = 44.

§ Distributed by individual a number of Research Councils to selected UK Higher Education Institutions to support knowledge exchange and impact from the research they fund. Unweighted base = 25.

† Such as the New Future Fund, grants/loans for SMEs focusing on R&D, Innovate UK Sustainable Innovation Fund.

9.2 Government actions to enable universities to contribute fully to the economy recovery

Looking forward, the survey sought the views of universities on what actions the UK Government could take in the short term – beyond the easing of specific measures introduced to reduce the spread of COVID-19 such as lifting Lockdown restrictions – to enable universities to contribute fully to driving an innovation-led economic recovery. Of the 61 respondents to the survey, free-text responses were received from 49 universities to this question. This section analyses the breadth of views expressed.

Table 11

Effect of selected government schemes on the ability of universities to initiate, support and deliver innovation-focused activities and projects through Lockdown and into the early stages of the economic recovery, by KEF cluster

Government scheme	All	Cluster§				Variation across clusters‡
		KEF_V	KEF_X	KEF_E	KEF_JM	
Research England's Higher Education Innovation Fund (HEIF)	1.8	2.7	2.9	2.1	0.6	
		JM	JM		V; X	
Research Council Impact Acceleration Account (IAA) funding	1.8	2.0	2.4	..	..	n.a.
UKRI rapid response calls for Covid-19 research	1.7	2.4	2.5	1.8	0.8	**
		JM	E; JM	X; JM	V; X; E	
UKRI grant extension allocations	1.6	1.6	1.9	1.8	0.9	
			JM	JM	V; X; E	
Coronavirus job retention scheme	1.1	0.8	1.3	1.0	1.1	
Government support packages for innovative businesses	1.0	1.7	1.1	1.0	0.8	
		X; E; JM	V	V	V	
Ability to re-purpose UKRI grants to address Covid-19 issues	1.0	1.4	1.7	0.6	0.6	*
		E; JM	E; JM	V; X	V; X	

§ For each cluster the second row for each funding source identifies those other clusters for which a pairwise comparison of the result is statistically different based on the non-parametric Dunn's test.

‡ Based on the Kruskal-Wallis non-parametric test. Levels of significance: *** 1%; ** 5%; * 10%.

9.2.1 More funding

Most of the universities responding to the survey described a need for increased funding to enable them to play an active and strategic role in driving an innovation-led economic recovery from COVID-19. Different types of funding were highlighted by respondents, reflecting the different types of activities required to develop and deploy university expertise, intellectual property, and physical assets to contribute proactively to innovation.

Most frequently cited was the need to increase core funding for knowledge exchange (such as Research England's HEIF, the University Innovation Fund in Scotland, Northern Ireland's HEIF, and the new Research Wales Innovation Fund, RWIF). This type of funding plays a crucial role in enabling universities to build up their overall institutional capability and capacity to engage in knowledge exchange and leverage the expertise, and ideas and technologies emerging from research, to drive innovation.

Evidence from our survey shows that this type of funding has been important for underpinning universities' abilities to contribute to innovation in response to the pandemic. Respondents argued that, as we move into the economic recovery and local, national and global renewal post-COVID, and call on universities to play ever-increasing roles in driving innovation and economic renewal, this type of funding will become ever more important. Respondents could see growing needs for such funding to not just continue to deliver existing KE services but also to strengthen their role in developing local innovation ecosystems, and find new ways of engaging with SMEs who are likely to find it even harder to finance engagements with universities as a result of the severe pandemic-induced economic recession.

Survey respondents also called for more post-research translation, development and commercialisation funding to support the movement of ideas and technologies along the research commercialisation process towards innovative applications. This, they argued would help close a key gap between the state of ideas and technologies that typically emerged from university research (typically high risk technically and commercially) and the state required to more easily secure private sector investment to continue its further development into commercial applications. Others noted that while maintaining fundamental research was essential, it was important to balance this with an appropriate level of resource within universities to support its translation to the point where the private sector is willing to become involved. Some respondents also noted that as translational funding gets closer towards application, there should be a growing emphasis on collaboration and engagement with users in the private, public and third sectors.

There were also some calls for more challenge-driven funding that focused on identifying clear and specific challenges to be solved, and supporting not just the underpinning research but also its pull-through along the research-to-innovation pathway into applications. This, they argued would become more important post-COVID to address other major global, national and local challenges. They argued that this was not easy in the current UK funding landscape and required both greater flexibility of funding programmes and the bringing together of funding programmes from across different agencies and government departments. Linked to this was a call for further 'outcome'-driven funding as exemplified by the Strength in Places Fund, which focuses on the outcomes desired and creates incentives for the full range of innovation stakeholders in the relevant ecosystem to assemble. In both these cases funding should allow for investments to be made in not just the underpinning R&D but also in technology development and commercialisation activities and the linked building or strengthening of the capabilities, ecosystems and supply chains to facilitate the realisation of impacts.

Building international collaborations and links will also become more important post-COVID, not least as the UK completes its transition out of the European Union. There were calls for ensuring full access to Horizon Europe, or failing this, mechanisms to enable UK researchers to collaborate effectively with others around the world to address critical global challenges. Developing such links requires resources and support. Thought also needed to be given to how the UK could invest strategically alongside international research collaborations to capture and anchor more of the downstream value arising from research in the UK.

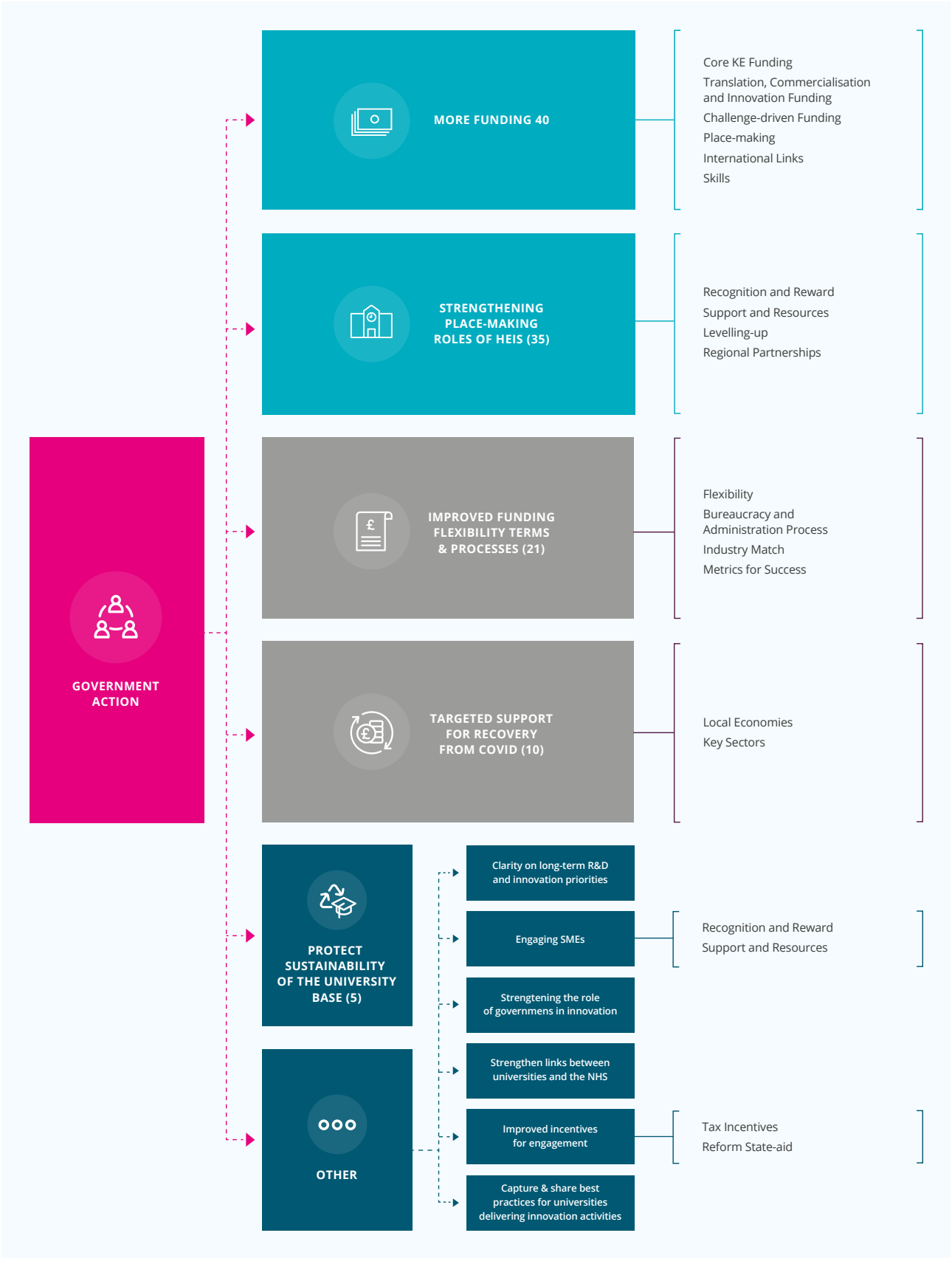
There were also calls for more research and innovation funding to address place-specific challenges and opportunities, and to drive place-making where universities have a critical role to play. In particular:

+ **Strength in Places has been welcomed by the sector** and a number of universities called for more outcome-driven funding of this type that incentivises the building of regional consortia to drive place-driven outcomes.
+ **Concerns about the lack of clarity on the Shared Prosperity Fund** which is due to replace ERDF as we leave the European Union. ERDF provided a significant volume of R&D and innovation-focused resources to less developed regions of the UK, not least to support innovation, productivity and competitiveness of local SMEs. The importance of R&D and innovation within the future SPF is unclear with justifiable causes for concern.
+ **Place-driven funding calls need to be flexible** to allow different types of R&D and innovation support mechanisms to be brought together in a region-specific way to allow regions to effectively address place-specific innovation challenges and opportunities.

More funding for skills and workforce development were mentioned by a number of universities. This included building the skills of researchers to engage externally and ensuring they had sufficient time to build the capacity and capability to engage; and investing in training the workforce to ensure they possess the skills necessary for the UK to effectively leverage key platform technologies (not least around digital and artificial intelligence) that will shape our world in the future.

As decisions are made about R&D funding post pandemic, one respondent raised a particular concern: that smaller institutions with pockets of research excellence delivering expertise into specific sectors were not disadvantaged at the expense of growing concentration of research and innovation-engagement activities within large research-driven institutions.

Figure 23 **Map of areas of calls for greater government action**



Note: Number in brackets provides the number of responses citing each area. Total number of responses: 49.

9.2.2 Strengthening the place-making roles of universities

Many of the universities responding to the survey argued that the UK Government needed to do more to enable universities to strengthen their place-making roles in their local economies and communities. There were calls for government to ensure that universities of all types formed a critical part of delivering the emerging R&D place agenda, leveraging their wide range of knowledge, human, social and physical capital. More broadly there needed to be greater recognition and reward by governments and funders of the place-making roles of universities; particularly for those located outside major cities and the Greater South East.

As discussed in section 9.2.1 respondents to the survey called for greater resources to support place-making. **This included support for:**

- **Developing innovation districts**
- **Actively engaging with local businesses** to help them recover from the effects of the pandemic and find new innovation-driven market opportunities
- **Enabling them to play an active role in a region's industrial transformation**, particularly where places are dominated by declining legacy industries with low productivity and low value jobs
- **Engaging with regional stakeholders** to strengthen regional supply chains

To strengthen the roles of universities in their places, there were calls for greater support to develop and sustain regional partnerships between universities and with other critical innovation stakeholders to develop bottom up solutions to regional innovation challenges and opportunities. This, some respondents argued, would help to strengthen the capabilities of regional innovation ecosystems and develop more comprehensive portfolios of innovation services and support to regional businesses. However, one university cautioned that place-based approaches should not preclude regions reaching outside of their areas to collaborate to deliver their region-specific goals.

A number of respondents also made the case that the UK Government must take tangible steps to deliver the levelling-up place agenda and address the significant regional inequalities in socio-economic that exist across the UK, not just between the Greater South East and other parts of the UK, but also between our cities, small towns, and rural communities. Calls were made to ensure that funding priorities and allocations moving forward reflected the commitments to levelling up and addressing regional disparities in research and innovation funding.

9.2.3 Improved funding flexibility, processes, and terms

The second category of calls for government action focused on improving funding flexibility, processes and terms to address COVID-induced challenges and disruptions facing universities and firms, some of which may last a number of years. On flexibility, there were calls for broadening the definition of innovation to reflect the current landscape to include more incremental innovation and technology adoption/adaptation to support business survival and renewal; greater flexibility on project start and end dates to accommodate disruptions caused by the pandemic; and continued flexibility on how to best manage funding streams to build agility and responsiveness within universities.

There were also calls for more efforts to reduce bureaucracy around grant administration and contracting, simplifying access to funding, greater consideration of the amount of time required to assemble strong bids in response to major challenge-driven calls, and simplification of innovation-focused funding for SMEs. In particular, as the UK exits the European Union it was thought there could be an opportunity to address bureaucratic hurdles associated with securing and administering projects from the European Regional Development Fund (ERDF).

Some university respondents also made the case that more effort had to be made to enable effective integration of funding programmes from different funding agencies and government departments. In particular the link between investments to drive innovation and building the skills necessary to exploit innovative advances needs to be strengthened.

With many companies – and in particular SMEs – facing significant financial pressures as a result of the pandemic, there were calls from a number of universities for funding agencies to make adjustments to key terms of engagement, in particular around requirements for industry matched funding, and on the maximum 'intervention

rate' allowable (i.e. the maximum proportion of public funding in total costs). Limits, they argued, could hamper SME engagement in the short- to medium-term.

Concerns were also raised about the suitability of key metrics that drive funding allocations and measures of success. A few universities called for the current development of key metrics systems to ensure that the full breadth of economic and social outcomes – many of them hard to quantify let alone monetise – are captured, and that they recognise and value the UK's diverse university system.

9.2.4 Targeted support to drive the economic recovery from COVID-19

Many areas and many sectors will suffer long-lasting damage as a result of the pandemic and the devastating effects it has had on economic activity. These effects will inevitably be unevenly spread across the nation, across sectors, and likely even within sectors for example between large companies and the SMEs in their supply chains. There were a number of calls from universities responding to the survey for the government to work closely with them to develop targeted funded interventions to enable them to provide support to help those places and sectors badly affected by the pandemic to recover, adapt and renew post-crisis.

9.2.5 Ensure the sustainability of the university base

Questions were being raised about the financial sustainability of the university research base even before COVID-19 hit the UK, with many types of research and knowledge exchange activities not able to recover full costs and requiring cross subsidy from other areas (PACEC, 2015). Responses from a number of universities raised concerns that the pandemic had exacerbated this issue.

Moving forward it is important that universities and government funders have a realistic and robust discussion about the full costs of delivering on the growing expectations on universities; to not just research and teach, but also to proactively work to raise R&D and innovation in the economy, to level up across the regions and nations of the UK, and now to support local economies and communities in recovering from COVID and adapting to the new industrial landscape. If this changes the balance in the portfolio between high and low cost-recovery activities, and the effects of the pandemic coupled with Brexit changes the ability of universities to recover full costs, universities will face significant pressures on their financial sustainability.

9.2.6 Other areas

A range of other areas for government actions were raised by university respondents to the survey including calls to:

- **Provide clarity on long-term R&D and innovation priorities** to enable universities and firms to invest with a greater degree of certainty in building the long-term enabling capabilities and infrastructure to deliver on these priorities.
- **Strengthen the recognition and support for engaging with SMEs**, recognising that working with this type of firm may become even harder in the economic recovery period, yet even more important for successful local and national recovery and renewal.
- **Strengthen the entrepreneurial role of governments** in driving early stage and breakthrough technologies and innovations. Crucially, as Mazzucato (2016) argues, governments should move away from simply investing to correct market failures, de-risking technologies to attract private sector investment, to investing along innovation chains driven by key societal missions. They should leverage their ability to take calculated risks and become an 'investor of first resort, not just a lender of last resort' (Mazzucato, 2016, p.3).
- **Build on partnerships** developed to respond to the pandemic to strengthen longer term links between universities and the NHS to drive innovation in the healthcare system in the UK.
- **Review tax incentives and state-aid rules** and explore whether these can be developed to encourage greater collaborations between universities and firms, particularly to support engagements with SMEs.
- **Invest effort to capture and share best practices for universities** in delivering innovation-focused knowledge exchange and commercialisation activities.

Summary of key findings

A number of UK Government schemes were introduced to help to support the supply and demand side of university-industry collaborations. All programmes explored in this study had a positive effect on the ability of universities to continue to initiate, support and deliver innovation-focused activities with partners. Perhaps unsurprisingly, universities viewed those funding programmes that directly supported the functioning of the university-innovation interface and the active translation and commercialisation of research as having the greatest positive effects.

The universities responding to the survey also identified a number of government actions that could help to enable the university system in the UK to contribute fully and strategically to economic recovery and renewal.

Many called for more funding in a number of areas. In particular to support:

- The enabling system of knowledge exchange infrastructure and support
- Post-research translation, development and commercialisation activities that helps ideas and technologies progress along the research-to-innovation pathway towards application
- Delivery of challenge-and outcome-driven programmes
- The building of international collaborations and links, which will become even more important as the UK transitions out of the European Union.
- Universities also emphasised the importance of the place-making roles of their institutions in tackling place-specific challenges and opening up new opportunities for wealth creation. However, this needs to be adequately resourced and supported by government. Related to this are calls for the UK Government to maintain their focus on 'levelling-up' and make tangible steps to deliver on this agenda.

Many places and sectors will suffer long-lasting damage as a result of the pandemic. The effects will inevitably be unevenly spread across the UK and its industries. There were calls for the UK Government to work closely with universities and other key stakeholders in national, sectoral and local innovation systems to develop targeted and funded interventions to help those places and sectors badly affected by the pandemic to recover, adapt and renew post-crisis.

There were also calls for efforts to improve the flexibility, bureaucracy and terms of funding programmes to make it easier to develop effective funding proposals, invest coherently along the research-to-innovation pathway to ensure pull-through and translation of ideas into impacts, and attract the necessary partners. Related to this, as more challenge-driven programmes emerge, more effort needs to be made in ensuring effective integration and coordination of funding programmes from different funding agencies and departments.

The suitability of key metrics that drive funding allocations and measures of success was also raised. Here there were calls to ensure that the full breadth of economic and social outcomes – many of them hard to quantify let alone monetise – are captured, and that funders recognise and value the UK's diverse university system in delivering impacts at different scales (globally, nationally and locally).

Lastly, the pandemic has created significantly intensified financial pressures on universities. With the sustainability of university research already under pressure pre-pandemic, moving forward it is important that universities and government funders have a realistic and robust discussion about the full costs of universities working simultaneously to deliver on a range of government priorities including not least raising R&D and innovation in the economy, contributing to levelling-up, and supporting industries, economies and communities in recovering from the effects of the pandemic and adapting to the new socio-economic and industrial landscapes.

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Appendix A Sector classification

The following table provides a list of the sectors that were presented to university leaders in the survey. It also provides the sector groups that were developed during the analysis of the survey responses. Given the relatively small sample size (61) we had to aggregate individual sectors to sector groups to ensure sufficient group size for the analysis. This inevitably led to a series of pragmatic trade-offs between specificity of sector and the ability to robustly analyse the results.

Sector classification used in the survey

Sector group	Sector
Pharmaceutical Manufacturing & Medical Biotechnology	+ Pharmaceutical Manufacturing & Medical Biotechnology
Aerospace manufacturing	+ Aerospace manufacturing
Automotive, other transport, and machinery manufacturing	+ Automotive manufacturing + Manufacture of other transport equipments (inc. ships, rail, motorcycles) + Manufacture of machinery
Manufacture of electronic and electrical components & equipments, instruments	+ Manufacture of medical devices + Manufacture of electronic components & equipments (inc. computers, communications) + Manufacture of electrical equipments (inc. motors, domestic appliances) + Manufacture of instruments & appliances (measuring, testing, navigation, optical)
Manufacture of fuels, chemicals, materials, & other manufacturing n.e.c	+ Manufacture of fuels, chemicals, plastic metals & minerals (exc. pharma) + Other manufacturing (not elsewhere classified)
Agriculture, fishing and forestry, and manufacture of food, beverages, clothing, wood, paper, textiles	+ Agriculture, Forestry & Fishing + Manufacture of food, beverages, clothing, wood, paper, publish & print
Computer programming, consultancy and related ICT activities (inc. software development)	+ Computer programming, consultancy and related ICT activities (inc. software development)
Scientific and technical services (inc. engineering, technical testing & analysis, non-biotech. R&D)	+ Scientific and technical services (inc. engineering, technical testing & analysis, non-biotech. R&D)
Other knowledge-intensive services	+ Transport + Financial and insurance activities + Telecommunications and information services + Professional services (inc. legal, accounting, business consultancy, advertising & market research) + Public Administration, Defence & Education + Other
Human health and social work activities (inc. residential care)	+ Human health and social work activities (inc. residential care)
Creative industries and media	+ Creative industries and media
Other non-manufacturing sectors	+ Mining and Quarrying + Electricity, gas & water supply + Construction + Wholesale and retail trade + Hospitality, tourism and recreation + Real estate activities

UCI University Commercialisation & Innovation *Policy Evidence Unit*

About the UCI Policy Evidence Unit

The University Commercialisation and Innovation (UCI) Policy Evidence Unit at the University of Cambridge aims to support governments and university leaders in delivering a step change in the contributions universities make to innovation and economic prosperity through their commercialisation and other innovation-focused activities and partnerships.

The UCI Policy Evidence Unit aims to improve the evidence base and tools available to key decision makers in public policy and university practice as they develop new approaches for strengthening university research-to-innovation and commercialisation pathways. To do so it will draw on the latest advances and insights from both academic research and policy practice, as well as lessons learned from experiences in the UK and internationally.

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National Centre for Universities and Business

About the National Centre for Universities and Business

The National Centre for Universities and Business (NCUB) is a strategic leadership network that provides a collective voice on the future of collaboration between universities and business. Driven by data and shaped by ideas, NCUB seeks to inform, influence and shape the future of collaboration. Our members share a commitment to working together to tackle some of the UK's biggest challenges. From adapting our education and training systems to developing the talent needed in the future, to transforming lives and opportunities through research and innovation.

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