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ISCF Next Generation Services Evaluation

Final Evaluation

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Charlotte Glass, Cristina Rosemberg, Nadya Mihaylova, Reda Nausedaite, Aaron Vinnik, Adebisi Adewusi

NEXT GENERATION SERVICES

AI & Data for the insurance, accounting & legal services sectors

£20.3m Industrial Strategy Challenge Funds

59 unique participants firms
20 research organisations

½ unsuccessful applicants did not proceed with their projects

Collaborative R&D Projects

4 large + 29 small + 4 data access

£9.4m direct co-funding from participants

£546k

Additional project investment post-grant

per participant [A]

Up to £28m across all participants in total

% Participants reporting **New knowledge / understanding** of the …

potential for applying AI solutions **94%**

challenges & opportunities relating to AI&Data **97%**

challenges & opportunities relating to sectors **86%**

New products & services

84% developed / improved a new product / service

84% now offer products/services that rely on AI/data analytics solutions

20% of whom started doing so since the programme began

2.4 new partnerships

with customers or end-users per participant [A]

⬆**6x annual R&D expenditure**
£100k per yr to £605k per yr [M]

Increased external equity investments

22% Participating businesses secured at least one deal

vs

7% unsuccessful applicants

Deal Value increased from **£250k to £1m** [M] / yr

Increased employment per participant

3 FTE retained + 1.5 FTE created during project[A]

Average employment increased from 10 to 19 following the programme [M]

Research Projects

3 academic research projects to build knowledge about how to adopt AI in these sectors…

39 formal collaborations
½ collaborators from industry
+
numerous informal collaborations

Contributions to **policy** and **practice** in the **UK** and **Europe**

199+ engagement activities

Training
750+ professionals trained through **new Masters courses & CPD modules**

£1.83m in-cash & in-kind contributions

Platforms for **knowledge sharing** between participants

87 publications

New Mini-Centre for Doctoral Training in Industry and Commercial Property Insurance

36 firms engaged in AI Design Sprints

AI for Services Network

1,400 + Members

34 events

2,400+ attendees

75% identified new commercial leads

495 Introductions

15 Collaborations

A – Mean   M – Median

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Executive summary

This report presents the final impact evaluation as part of the evaluation of UKRI's Industrial Strategy Challenge Fund on Next Generation Services (ISCF NGS).

The scope of the evaluation is to assess the extent to which the programme, including the activities funded, is making or has made an impact against its aims. The evaluation tests the extent to which the programme has delivered the outcomes and impact anticipated and the extent to which these are attributable to ISCF funding. This report provides an assessment of the progress made at the end of the programme, based on evidence collected between January and July 2022.

The programme

ISCF NGS was a £20m pioneer investment aimed at supporting the UK's global leadership and competitiveness in service sectors (specifically, the insurance, legal and accounting sectors), by fostering the uptake of Artificial Intelligence (AI) and increasing levels of data and digitisation in the delivery of these services.

The ISCF NGS Challenge started in April 2018, with grants awarded from December 2018 and ran up to February 2022. Activities were delivered across five different strands, namely Collaborative R&D grants, Data Access grants, Research Programme grants, the AI for Services network (managed by the KTN), and the international activities strand. Collaborative R&D grants comprised the majority of the programme funding (64% of all grant funding).

The NGS Challenge spent a total of £22.0m as a whole, of which £20.3m was allocated as grant funding across 48 projects, with an additional £9.4m in direct co-funding from participants.[1] It involved 79 individual organisations in these grants, and regularly disseminated information to 1,300+ people through the AI for Services network. The programme participants included a balanced mix of companies, covering firms in the end-user sectors in scope (i.e., operating in the accounting, legal and insurance sectors) and on the supply side, comprising technology providers in software development, AI, and data companies. More than 20 academic institutions were involved across all strands.

Evaluation findings

This evaluation of the NGS programme demonstrates that the programme has achieved its objectives.

There is a growing opportunity and demand for AI and data driven methods within the professional services and whilst the deployment of these technologies could support transformative change, their adoption and deployment has been challenged by a range of factors. This includes the existing business models and practices in place, supporting access to sufficient quantities of quality data to support data driven methods and the knowledge and skills required to support the uptake of these technologies.

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1 This value excludes in-kind contributions and funding withdrawn as a result of project terminations.

The NGS programme has helped to address these various challenges and this evaluation demonstrates that the programme has achieved or made substantial progress across all the main expected outcomes and impacts.

The relatively small investment in the programme, especially relative to the size of the three service sectors in scope, has meant that results have mostly materialised at the level of those organisations directly participating in the programme. In addition however, the programme has supported the formation of a wider cohort of organisations within the end-user sectors working with and / or to deliver solutions to professional service companies.

Engagement, partnerships and collaborations

The programme has supported a range of collaborations and partnerships and laid the foundation for further engagement. This included the formalisation of new collaborations and partnerships through collaborative projects, as well as providing the platforms for networking.

After engaging with the programme (at the proposal stage), both successful and unsuccessful applicants to the CR&D strands reported having established **new partnerships with customers and end-users** (with a slightly higher result for successful applicants). In fact, almost half of unsuccessful applicants stated that **the programme had been one of the main catalysts** for the establishment of these new relationships, and most of programme participants stated so. There is a strong expectation that these collaborations will continue, with 75% of participants agreeing they could see avenues for future collaboration with industry/academia due to the programme. Furthermore, 25% of participants and 23% of unsuccessful applicants indicate that these new partnerships and collaborations have resulted in access to further funding (beyond the ISCF NGS grant) to support their activities. At the close of their projects, 89% of participants reported they had developed or improved their collaboration and partnering skills due to the programme.

The **research projects reported 39 formal collaborations** and partnerships, most of which are with private organisations and has **leveraged £1.83m of cash and in-kind contributions**. The research projects also engaged with a wider cohort of organisations through a breadth of communication activities, so the true number of organisations engaged by the research projects is likely to be higher. The survey of a sample of these organisations indicates that the majority did not apply for the NGS programme, indicating the **research projects are extending the reach of the NGS programme beyond its core beneficiaries**. These partnerships and collaborations have then provided a platform for new and stronger connections between industry and academia.

Grant participants

2.4	Average number of new partnerships with customers or end-users after engaging with ISCF NGS
77%	Believe ISCF NGS was a catalyst for establishing new partnerships

n=69

Unsuccessful applicants

1.5	Average number of new partnerships with customers or end-users after engaging with ISCF NGS
53%	Believe ISCF NGS was a catalyst for establishing new partnerships

n=101
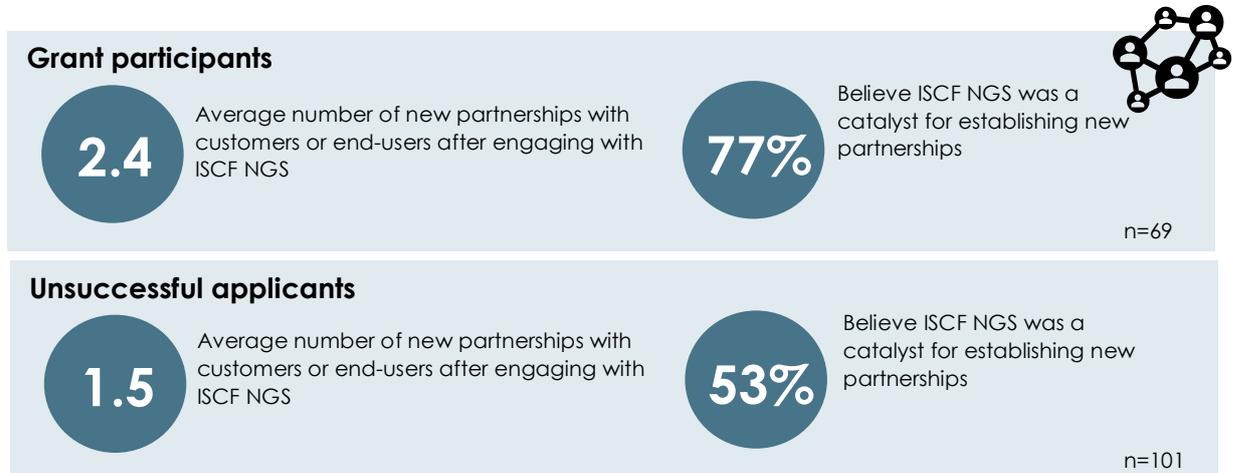
The programme's international activities have also supported the formation of new partnerships and collaborations. The Global Business Innovation Programme (GBIP) Singapore mission in 2019 was beneficial for participants to gain new contacts, with companies securing an average of 35 meetings per company. These new contacts were valuable for increasing their understanding of the market in Singapore, and companies reported that around half of the meetings generated at least some interest and potential for future collaboration.

Finally, since its launch in May 2019, the **AI for Services network has delivered 34 events to over 2,452 attendees**, both in-person and online. Around half attendees reported securing new contacts or collaborations, either commercial leads or new partners for collaborative research as a result of attending these events.

Investment, funding and leverage

Overall, the levels of R&D investment in general for both participants and unsuccessful applicants has increased. On average, programme **participants' general R&D expenditure increased by over 5 times**, from £100k at the baseline to £605k (median). Unsuccessful applicants also experienced and increase in R&D expenditure from £76k prior to the programme to £110k in 2021/2022.

Whilst the service sectors are becoming more innovative in general, the **NGS participants have a stronger focus on AI/data.**

Following the ISCF NGS programme, participating firms are investing more in AI/data R&D with a focus on the service sectors. Before ISCF NGS, participating companies were active in R&D in the area of AI and data applications but to a small scale. On average, participating firms increased their levels of investment in AI/Data R&D from £99k at the baseline to £628k following the programme. This is substantially higher than the unsuccessful applications (£86k to £183k). This also holds true across the cohort of participating firms. Prior to the programme, a fifth of participants were not investing in AI/data R&D, and only a third were investing more than £100k. After the programme, just over half were investing more than £100k.

Programme participants have continued to invest in their projects and ideas after the end of their projects. Participants had invested an average of - £164k in their projects prior to the NGS programme and then a further ~£546k 'post grant' (mostly from internal resources but also from other private investments and access to further public funding outside of ISCF NGS). If this were to hold across the 52 unique participating businesses in the ISCF NGS programme, then the **total cumulative investment would equate to around £28m**.

By contrast, 53% of unsuccessful applicants did not carry on with their ideas/projects, and those who did invested less. Despite investing £592k prior to applying to NGS, those that continued invested less than programme participants (£334k on average). There are various possible reasons for this decreased investment: the proposed project proved not to be viable; securing funding was critical to the progression of the project and no other sources of funding were secured; or that unsuccessful companies subsequently re-directed their attention to other areas of the business. These results provide an indication of the net benefit (additionality) of the programme.

Grant participants (average investment at different stages)

Investment prior to grant application		Investment as part of grant commitments		Investment post-grant
~£164k (n=22)	→	**~£116k** (£9.6m total, n=83)	→	**~£546k** (n=22) 50% accessed further public funding

Unsuccessful applicants (average investment at different stages)

~£592k (n=12)	→	**No grant**	→	53% didn't continue project Those who did averaged ~£344k (n=12) 25% accessed further public or private funding

The majority of programme participants (91%) believe that the NGS programme made the solutions developed more ready for further investment from the private sector. A fifth of participants also reported developing new fund-raising skills through their NGS project.

Compared to unsuccessful applicants, **participating businesses were more than three times more likely to have been identified on the Pitchbook database** which be interpreted as a positive signal of the strength of companies (50% of participants compared to 17% of unsuccessful applicants).

Participants have been more successful in securing external investment than unsuccessful applicants, despite a fall in the number of investment deals since 2018 due to the COVID-19 pandemic and retrenchment of the investment community. Relative to the entire pool of applicants to the programme, during the programme period, 22% of all participating businesses (base: 72) signed at least one deal compared to 7% of unsuccessful applicants (base:185).

In terms of the average number of deals per year between the baseline period (2013-2018) and the active ISCF NGS period (2019-2022) participants saw an increase from 8.5 on average per year to 12. By contrast, unsuccessful applicants stayed at the same levels and secured an average of 7.8 deals per year prior to the programme and 8.5 number of deals during the programme period.

The median **value of the external equity investments increased more significantly for participants, from £250k to £1m**, than unsuccessful applicants (£500k to £780k). Participating firms were also generating more inward investment from private funding sources on top of the grant funding through the ISCF than unsuccessful applicants.

New knowledge production and dissemination

The ISCF NGS programme aimed to promote the creation of new knowledge of practical usage for the sectors in scope. The evidence collected in this evaluation shows that **programme participants are creating new related knowledge**.

Academic researchers involved in the programme have produced a total of **101 academic publications**. 21 of these publications have come from research groups involved in the CR&D projects, and 87 publications emerging from the Research Projects, including journal articles, books and book chapters, policy briefings and consultancy reports. **Programme participants**

increased their publication of think pieces (including blogs), reporting an average of 9.7 outputs, up from 6.6 in a typical year prior to applying. For unsuccessful applicants, the number of think pieces published has decreased from 7.4 prior to the programme to 5.5 in the last year.

Research Projects delivered 199 engagement activities to disseminate the knowledge and insights gained, many of which include delivering presentations and webinars in collaboration with the AI for Services network. This demonstrates the added value of the AI for Services network in providing a valuable platform for disseminating learnings emerging from the programme.

Programme participants are producing more IP and exploitable trade secrets (i.e. confidential business information which provides a competitive edge) on average since joining the programme, reporting an increase from 1.0 to 2.2, whilst unsuccessful applicants reported a decrease from 1.6 at the point of applying to 0.8 in the past year.

Skills, capabilities, and attitudes towards AI

We have found evidence of **uptake of programme learning**. Participants believe they have gained increased skills and capabilities as a result of participating in ISCF NGS grants, with participation leading to a better understanding of the challenges, issues and potential of AI/data, as well as a better awareness of challenges and issues across different sectors. In addition, all participants reported developing new or improving their technical skills through their NGS project, with significant contributions to other organisational skills including problem solving, project management, strategic thinking, and business planning.

Members of the AI for Services network found value in being a member of the network, particularly with regards to understanding of commercial opportunities in applying AI&Data solutions, and in the approach to adopting these solutions.

Almost all participants in the CR&D projects reported **increased understanding of sector challenges and opportunities** (89%), of the challenges and opportunities **relating to AI&Data** (97%) and of the **potential for applying AI solutions in their sectors of activity** (94%).

89%	Increased understanding of sector challenges and opportunities
	(n=37)
97%	Increased understanding of challenges and opportunities relating to AI & Data
	(n=37)
94%	A better understanding of the potential for applying AI solutions in their sectors of activity
	(n=36)

The NGS programme also contributed to the development and production of wider training resources, including the development of a **new Masters degree and continuing professional**

development course and a **new mini-centre for doctoral training**, as well as **training materials and guidance tools** to facilitate organisational change.

Innovations and new economic activity

The programme has enabled companies to develop new innovations and enabled the development of new economic activity with strong evidence for impacts to turnover expected in future.

The programme has actively supported the development of new products and solutions, with **84% of participants reporting a new or improved product or service**, and further 10% of participants expect this to happen in the future. On average, the NGS CR&D projects **progressed their project by 3 TRLs (median)** at project close, with all projects progressing by at least one TRL. Participants were also significantly more likely to have trialled or tested new business models participating in the NGS programme.

Both participants and unsuccessful applications reported **an increase in the proportion of their current products and services that made use of AI solutions**. The programme also supported increased adoption of these technologies, 62% of end-user participants (8 out of 13 respondents) state that participation has led to new or improved internal processes, and further 10% expect this to happen in the future.

Programme participants reported an **increase in the proportion of participants who offer products/services that rely on the use of AI/data analytics** solutions, increasing from 64% prior to the programme to 84%.

Six different spin outs and start-ups have already materialised and ten other organisations expect this to happen in the future.

Participants in the CR&D projects reported **increased employment** due to their NGS project, indicating they had retained an average of 3 FTE and created a further 1.5 FTE (median).

Participants estimated that the benefits from new products, services, or process supported by the **NGS programme would lead to an annual combined turnover of £84m** (~£1.9m average benefit and ~£450k median benefit per company) and that this positive effect will last 6 years on average. The **total commercial benefits expected to accrue over time is £719m** in total across the 44 companies who have provided subjective views on the future commercial potential of their innovations (£13m average benefit and £2.4m median benefit per company).

1   Introduction

1.1   The evaluation

The objective of this study is to evaluate UKRI's Industrial Strategy Challenge Fund on Next Generation Services (ISCF NGS). This was a £20m pioneer investment aimed at supporting the UK's global leadership and competitiveness in service sectors (specifically, the insurance, legal and accounting sectors), by responsibly using Artificial Intelligence (AI), coupled with increasing levels of data and digitisation in delivery of their services, to the benefit of the UK. The evaluation is focused on determining:

- The extent to which the activities including the grants have implemented their planned activities and achieved their planned impacts (impact evaluation).

- The extent to which the Challenge has contributed to growing the burgeoning AI & data analytics sectors in the UK as part of the three sectors (impact evaluation).

- The extent to which the Challenge, and challenge activities, have effectively supported improved R&D capability and capacity (impact evaluation).

- The extent to which the Challenge has contributed to supporting the UK in supporting its leadership position in the three sectors (impact evaluation).

- The extent and nature to which the NGS programme design, including the challenge activities, governance and UKRI management, has facilitated interest, engagement, new collaborations and contributed to achieving the objectives of the programme (process evaluation).

The evaluation was conducted across three phases (as summarised in the figure below) and this report presents the results of phase 3b of the study, the Final Evaluation (D4).

Figure 1 Evaluation elements and phases
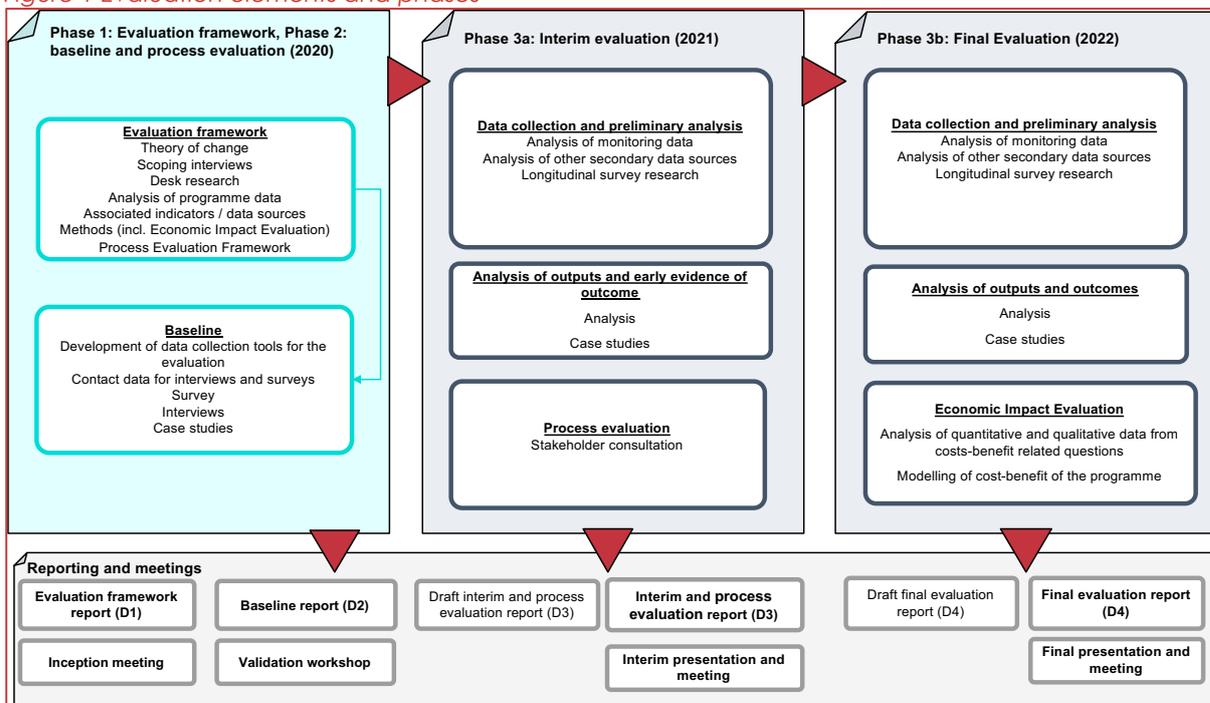
1.2 This report

The scope of the evaluation was to assess the extent to which the programme, including the activities funded, is making or has made an impact against its aims. This report provides an assessment of the progress made by the programme so far (with respect to its objectives and the indicators identified in the Evaluation Framework).

Whenever possible we provide a comparison with the baseline position to identify trends, and with a control group or benchmark to assess the extent to which the observed results can be attributed to the programme.

The remainder of this section sets out an overview of the evaluation methodology. The rest of the report is organised as follows:

- Section 2 presents a brief update on the wider sector since the baseline position for the NGS programme, including an overview of the target end-user sectors in scope
- Section 3 presents the Theory of Change that has guided the evaluation and an overview of the portfolio of the programme activities
- Section 4 sets out the emerging evidence of the impact of the Next Generation Services programme for programme participants.
- Section 5 presents a value for money assessment for the programme
- Section 6 reflects on this evidence to reach the overall conclusions of the evaluation, including the assessment of the programme's value for money

1.3 Methodology

The evaluation findings are based on the outcome of the following data collection and analysis activities:

- **Data analysis and data linking:** Which includes the analysis of the programme datasets (grants and participants, project completion forms, monitoring data, ResearchFish submissions), as well as the data linking and analysis to secondary data sources (e.g., firm-level data through FAME and Pitchbook, and researcher-level data from Lens)
- **3 interviews** to capture the views of programme delivery team on the wider reflections of the programme.
- **11 case studies:** This report contains the third and final iteration of the longitudinal case studies to capture longer-term outcomes and impacts of the programme have unfolded over time. The case studies cover 11 grants across three programme strands (Collaborative R&D grants, Data Access and Research).
- **Stakeholder surveys:** Three different surveys were launched throughout the study stage, covering all the programme strands. These are:
  - **Survey 1:** Successful programme participants and unsuccessful applicants of Strands 1-3 (CR&D, Data Access, Research programme). The sample size of the first baseline survey is 134 (54 successful and 80 unsuccessful), the follow-up interim survey is 91 (36 successful and 55 unsuccessful) and the final survey is 82 (34 successful and 48 unsuccessful).
  - **Survey 2:** People signed up into the AI for Services network mailing list (Strand 4). The sample size is 27 (8 submitted a grant proposal and 19 did not).
  - **Survey 3:** People participating in the Research Projects, either as formal partners, subcontractors or as wider stakeholders engaged in dissemination events and mailing

lists. The sample size is 21 (with 4 responses for TECHNGI, 11 for NextGenPSF and 6 for Unlocking the Potential for AI in English Law)

- **Validation workshop.** A validation workshop was held with the ISCF NGS programme team and evaluation study team on the 18th of August 2022 to discuss and validate initial findings and to steer the development of this report.

Appendix D shows further details on the surveys conducted, survey populations and final response rates, including further breakdowns of survey respondents.

2 Wider context

This section provides an overview of the wider market conditions that provide a key part of the operating environment for the ISCF NGS programme.

The UK has a leading reputation for providing specialist professional services. It is the largest exporter of professional and financial services in Europe and has more than doubled the value of exports in the last ten years. In 2019, professional services contributed £97bn to the UK economy, including £54bn from legal and accounting services. The sectors have also demonstrated resilience to the impact of the COVID-19 pandemic.

Here we analyse the market size of the end-user sectors (legal services, accounting, and insurance) and discuss recent trends in technology adoption in these sectors.

2.1 Legal services

The legal services industry in the United Kingdom is the largest in Europe and second largest in the world.

The UK is home to a wide range of international law firms with more than 200 foreign law firms from around 40 jurisdictions now operating in the country and all of the world's top 50 law firms having an office in London.[2] The sector employs around 365,000 people, two thirds of whom are based outside London.

The sector generated revenues of roughly £37bn in 2020 and is second only to the United States.[3] It accounts for a third of Western European legal services fee revenue and around 7% of global legal services fee revenue (which totalled about $713bn in 2020).[4] The sector contributed 1.5% of UK gross value added (GVA) in 2019 and contributing a trade surplus of £5.6bn in 2020. Legal services contributed £29.6bn to the UK economy in 2019.[5] The UK exports of legal services was seven times higher than its imports in 2019.

As a result of Brexit and COVID-19, there has been a significant shock to levels of activity in the short term, with falls in the number of legal activities enterprises, the level of turnover and GVA of around 10% in 2020. These are expected to begin to recover after 2020, but not expected to return to previous levels until the end of 2022. By the end of this forecast period (2028), the forecasts expect these indicators to have increased on the 2019 (pre-shock) levels by 14%.[6]

Despite this, there are early indications that the UK's legal services sector has continued to grow, with the revenue out of the UK's largest 100 law firms growing by 4% to £28.8bn in 2021.[7] Notably whilst the top 25 firms account for 80% of this revenue (£22.4bn), lower ranked firms demonstrated resilience and even significant increases in productivity following the pandemic.[8] The growth in the number of lawyers in 2021 compared to 2020 was up slightly, at 2.6%. The levels of employment in legal activities businesses follow a different trajectory. In the

2 https://www.thecityuk.com/media/oi5iqvzy/legal-excellence-internationally-renowned-uk-legal-services-2021.pdf

3 https://www.statista.com/topics/8517/legal-services-industry-in-the-uk/#dossierKeyfigures

4 https://www.thecityuk.com/media/yhekm1xr/key-facts-about-the-uk-as-an-international-financial-centre-2021-v2.pdf

5 https://www.thecityuk.com/media/oi5iqvzy/legal-excellence-internationally-renowned-uk-legal-services-2021.pdf

6 https://www.lawsociety.org.uk/topics/research/forecasting-economic-activity-levels-in-the-legal-activities-sector

7 https://www.thecityuk.com/our-work/legal-excellence-internationally-renowned-uk-legal-services-2021/

8 https://www.thomsonreuters.com/en/reports/state-of-the-uk-legal-market-2022.html

short-term, employment levels were protected by the furlough scheme and then are expected to slowly increase – by 12,000 (3%) by 2028.[9]

In-house law departments are primarily concerned with helping their businesses recover from the COVID-19 pandemic, staying on top of the rapidly changing regulatory landscape, and leveraging digitalisation to work more efficiently within the organisation.[10]

2.1.1 LawTech

In the general sense, "LawTech" can be defined as the application of technological solutions for uses cases specific to the legal system. Within lawtech, there exists a subset of technologies that make use of artificial intelligence for the purposes of business management (e.g., people and resource management, finance and operations, managing client relations), law-related tasks (e.g., knowledge management, matter management, risk management, legal rights management), and performing work (e.g., documents and contracts, mergers and acquisitions, litigation).[11]

Survey research by Capital Economics has found that, currently, around 29% of businesses in the legal sector have adopted at least one AI technology. This translates to approximately 18k firms that are currently using AI. Examples of ways in which AI is reportedly applied by these companies in the legal profession in the UK include reviewing contracts and legal research as well as generating forecasts of litigation outcomes.[12] The legal services sector is also set to see the largest increase in adoption rates, with an expected increase of +29.8 percentage points by 2040.[13]

It is worth drawing a distinction between the different actors that are active in the lawtech space. On the one hand, there are the individuals and businesses that are involved in the development of lawtech solutions. As of 2020, there were and estimated 189 specialist lawtech providers in the UK, employing over 5,600 people and having raised nearly £700m in equity investment since 2012.[14] Furthermore, Frontier Economics estimates that there were around 7,100 people in the UK employed in the development and provision of lawtech products and services in 2021.[15]

On the other hand, there are the lawyers and other professionals that interact with lawtech as end-users. The recent 'Unlocking the Potential of AI for English Law' research project found that around half of all English and Welsh solicitors now routinely use at least one type of AI-assisted lawtech solution, although usage varies significantly by solution type.[16]

9 https://www.lawsociety.org.uk/topics/research/forecasting-economic-activity-levels-in-the-legal-activities-sector

10 https://www.thomsonreuters.com/en/reports/state-of-the-uk-legal-market-2022.html

11 Parnham, R., Sako, M. and Armour, J. (2021). *AI-assisted lawtech: its impact on law firms*. Oxford: University of Oxford. December 2021.

12 For a comprehensive overview of AI in law and legal practice, https://emerj.com/ai-sector-overviews/ai-in-law-legal-practice-current-applications/

13 Capital Economics (2022) AI activity in UK businesses https://www.gov.uk/government/publications/ai-activity-in-uk-businesses

14 Frontier Economics. (2021). Economic contribution of lawtech. Available at: http://resources.lawtechuk.io/files/RPT-lawtech%20economic%20contribution-07-07-2021%20STC.pdf

15 Frontier Economics. (2021). Economic contribution of lawtech.

16 Parnham, R., Sako, M. and Armour, J. (2021). *AI-assisted lawtech: its impact on* law *firms*. Oxford: University of Oxford. December 2021.

In addition, in-house legal functions are increasingly adopting alternative legal service providers (ALSPs), which are now becoming a mainstream segment of the legal market. This trend is partly driven by the COVID-19 pandemic and pressures to increase cost efficiency and their expanded technology offerings, including AI. The fastest growing services provided by ALSPs is consulting on legal technology, as these firms are often early adopters and innovators for cutting edge technologies.[17]

With regards to the overall lawtech sector, LawtechUK[18] estimates the annual demand for lawtech to be worth around £22b[19]:

- £1.7b annually in productivity gains for legal service providers
- £11.4b in annual revenue from lawtech and innovation to meet the needs of SMEs and consumers through accessible and affordable services
- £8.6b in cost savings for SMEs using lawtech services

The lawtech sector also generated an estimated £400m-£650m in 2020, accounting for 1.2-2.2% of the total GVA of the legal services sector.[20]

In terms of investment, investments into lawtech firms grew by 101% from 2017 to 2022 outperforming investment in fintech[21] (20%), climatetech[22] (5%) and healthtech[23] (47%).[24]

Regarding future growth of the lawtech sector by 2026, Frontier Economics estimates that annual investments in lawtech businesses could increase to £1.6b to £2.2b.[25] The forecast also estimates employment growth of up to 8-12.5k and a GVA generated by these companies of £0.8-£1.2b.

Around a quarter of alternative legal service providers interviewed were currently using AI, with an additional third of interviewees evaluating AI's potential.

2.2   Accounting

There are estimated to be around 43,250 accountancy firms in the UK, around 80% of which are small with four employees or less. In particular the market primarily consists of freelance /

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17 https://www.thomsonreuters.com/en/press-releases/2021/february/alternative-legal-service-providers-are-quickly-becoming-mainstream-for-law-firms-and-corporations-creating-a-14-billion-market.html

18 LawtechUK is a collaborative initiative between Tech Nation, the Lawtech Delivery Panel and the Ministry of Justice, to support the digital transformation of the UK legal sector.

19 LawtechUK. (2021). The LawtechUK Report 2021: Shaping the Future of Law. Available at: https://35z8e83m1ih83drye280o9d1-wpengine.netdna-ssl.com/wp-content/uploads/2021/07/LawtechUK-Report-2021-Final.pdf

20 Ibid.

21 Fintech refers to the integration of technology into offerings by financial services companies in order to improve their use and delivery to consumers

22 Climatetech is defined as technologies that are explicitly focused on reducing greenhouse gas emissions or addressing the impacts of global warming.

23 Healthtech is defined by the World Health Organization as the "application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures, and systems developed to solve a health problem and improve quality of lives".

24 LawtechUK. (2021). The LawtechUK Report 2021: Shaping the Future of Law.

25 Frontier Economics. (2021). Economic contribution of lawtech.

independent accountants, with most employing 1-2 staff. As such, it is therefore not surprising that around half of these firms generate under £100k per year.[26]

Estimating the total number of accountants in the UK is challenging as many never formally qualify or secure qualifications not recognised by the National Central Council of Accounting Bodies (CCAB). According to information provided by accountancy organisational bodies[27] membership has continued to grow, increasing to 381,441 in 2020.

In 2021, turnover among the UK's accounting firms increased to £36.6bn, up 15% compared to the previous year – the largest revenue on record for the sector.[28]

The total number of registered audit firms has been steadily decreasing, from 5,394 in 2018 to 5,007 at the end of 2020.[29] However, number of accountancy jobs has also increased in recent years, rising to 430,000 jobs in the UK in 2020 – up 12% from 2015 and compared to a 2% increase for all sectors.[30] This is representative of a greater degree of consolidation within the accounting services sector.

2.2.1   Account-tech

Contrary to the legal services sector, the state and impact of AI adoption in the accounting sector has not been well-documented. Recent research by Capital Economics on AI activity in UK businesses identifies finance and accounting as one of the four sectors with highest AI adoption rates (the other sectors being legal, IT and telecoms, and media, advertising and sales). Specifically, the share of businesses in the UK finance and accounting sector in 2020 was estimated at around 26%. The challenge, however, is disentangling accounting from other financial services.

Common use-cases for the application of AI in accounting include fraud detection and prevention, operations forecasting, data input automation, automated close procedures, and risk assessments. Today, the so-called 'Big Four' accounting firms are already implementing AI in their own processes. KPMG, for instance, is using AI to improve its audit processes[31] while Deloitte is implementing AI for document review in investigations, mergers, contract management and leasing arrangements.[32] Furthermore, EY has leveraged AI within its advisory business automating over 250 processes and saving an estimated 2m hours of work.[33] Lastly, PwC is implementing predictive analytics, cognitive computing and machine learning to examine transactions as well as users and accounts to identify suspicious transactions.[34]

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26 https://www.nimblefins.co.uk/business-insurance/accountant-insurance/number-accountants-uk

27 six UK Chartered Accountancy Bodies, the Association of International Accountants (AIA) and the Association of Accounting Technicians (AAT)

28 https://www.accountancyage.com/2022/03/03/accounting-firms-must-not-neglect-sound-management-amid-record-revenues/

29 https://www.frc.org.uk/getattachment/e976ff38-3597-4779-b192-1be7da79d175/FRC-Key-Facts-Trends-2021.pdf

30 https://www.frc.org.uk/getattachment/e976ff38-3597-4779-b192-1be7da79d175/FRC-Key-Facts-Trends-2021.pdf

31 https://home.kpmg/ch/en/blogs/home/posts/2021/10/automating-the-auditor.html

32 https://emerj.com/ai-sector-overviews/ai-in-the-accounting-big-four-comparing-deloitte-pwc-kpmg-and-ey/

33 https://www.ey.com/en_uk/alliances/how-ey-is-empowering-business-with-artificial-intelligence

34 https://www.pwc.com/gx/en/issues/data-and-analytics/apply-advanced-analytics.html

Beyond large businesses such as the Big Four, a comprehensive view of the prevalence and impact of AI in the UK insurance sector is still lacking. To date, widespread adoption of AI techniques in accountancy has been minimal.[35]

2.3   Insurance

The UK insurance industry is the largest in Europe and fourth largest in the world and the UK is home to both a large domestic market and multinational companies,

In 2021, the financial and insurance services sector in the United Kingdom had a gross value added (GVA) that amounted to over £161bn, compared with £159bn in 2020.[36] 113,700 people are directly employed by insurance companies and 196,300 are employed in auxiliary services to insurance and pension funding; such as broking and third party services.[37]

The COVID-19 pandemic has had wide reaching impacts, including accelerating digitalisation for insurers. For example, in the insurance industry, 85% of CEOs indicated that COVID-19 has accelerated their plans to digitalise their businesses, however the insurance industry is still perceived to be lagging behind other financial industries in terms of digitalisation.[38] Overall however, 'insurance has digitalised its existing business models but not necessarily challenged them.

2.3.1   Insurtech

McKinsey defines insurtech businesses as "technology-led companies that enter the insurance sector, taking advantage of new technologies to provide coverage to a more digitally savvy customer base".[39] To date, insurtech companies has largely been focussed on the retail sector, targeting younger customer segments though online and mobile channels and digital technologies. [40] More recently, insurtech has also moved into the commercial segments where innovative products such as peer-to-peer and digital brokerage as well as drone inspection for underwriting and claims are offered directly to SMEs.[41] In terms of personal line insurance, the emphasis of insurtech lies on personalisation as well as customer-centricity.

It is worth noting that there is a relative lack of recent data regarding the insurtech market in the UK as well as the level of adoption insurtech and related solutions in the UK. A 2019 analysis by PwC of the insurtech market in the UK has found that, while there is investment appetite within the insurance market and that capital is available, insurtech companies in the UK have yet to reach a scale that warrants large investments and that, to date, most investment has been in the form of seed capital. This has created a scenario in which insurtech companies are currently struggling to move beyond the initial pilot or proof of concept stage. However, PwC also estimates a market opportunity for insurtech of around £50b by 2030. With regards to the use of AI-driven insurtech, solutions focus on areas including claims and benefit management,

35 https://www.icaew.com/technical/technology/artificial-intelligence/artificial-intelligence-the-future-of-accountancy

36 https://www.statista.com/statistics/285079/financial-and-insurance-sector-gross-value-added-gva-in-the-uk/

37 https://www.abi.org.uk/globalassets/files/publications/public/key-facts/abi_key_facts_2021.pdf

38 https://www.cii.co.uk/media/10127554/cii-new-generation-london-market-innovation-report.pdf

39 https://www.mckinsey.com/industries/financial-services/our-insights/insurtech-the-threat-that-inspires

40 PwC. (2019). The untapped potential within the UK insurance market.

41 https://www.mckinsey.com/industries/financial-services/our-insights/insurtech-the-threat-that-inspires

products and pricing, sales and distribution, as well as underwriting and risk management.[42] PwC has found that, as of 2019, 54% of insurers are investing in AI to increase efficiency and better understand customer needs.

With regards to the potential impact of AI on the insurance market, McKinsey has identified three key areas where impacts are likely to occur by 2030.[43] These areas are distribution, underwriting and pricing, and claims. Regarding the distribution of insurance, the use of drones, Internet of Things devices and other available data are expected to speed up the purchasing of insurance through algorithm-generated risk profiles. Furthermore, usage-based insurance (UBI) products are expected to become more prevalent, particularly for car insurance[44] with the leveraging of telematics[45]. In the long run, the advent of insurtech and other implementations of AI in insurance are expected to fuel the transition of the insurance sector from the traditional 'purchase and annual renewal' model of insurance towards a model of continuous adaptation to individuals' behavioural patterns.

Regarding underwriting and pricing, McKinsey foresees its disappearance for the majority of personal and small-business products in life, property, and casualty insurance. The primary reason for this is that these insurance products are most likely to be automated and supported through machine learning and deep learning models. Furthermore, insurers are expected to increasingly use information from mainline carriers, reinsurers, product manufacturers and product distributors for ex ante underwriting and pricing decisions.

Lastly, claims will continue to be an important function for insurers. However, McKinsey predicts that more than half of all claim's activities will likely be automated with advanced algorithms handling initial claims routing. This, in turn, will increase the overall efficiency and accuracy of insurance claims services.

2.4   AI development and adoption

The UK has a strong and growing technology AI sector. According to the Global AI Index, the UK ranks third place overall, performing well in terms of both technology capability and commercial support (e.g., start-up activity, investment and business initiatives based on AI) ('commercial', 4th globally).[46]

Companies in the AI sector specifically, received investments of around £1.3b between August 2020 and August 2021.[47] On average, UK AI companies received around £4.8m in funding, ranking the UK 5th globally behind countries including the US (£8.8m in average funding per company) and China (£31m in average funding per company).[48]

Globally, the Digital Futures Index 2021-2022 estimates that around 7% of the world's AI companies are situated in the UK, ranking it second after the US (40% of AI companies) but

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42 https://www.pwc.co.uk/industries/financial-services/insurtech-startupbootcamp/emerging-technologies-in-insurance.html

43 https://www.mckinsey.com/industries/financial-services/our-insights/insurance-2030-the-impact-of-ai-on-the-future-of-insurance

44 https://www.insurancebusinessmag.com/uk/guides/what-is-usagebased-insurance-116604.aspx

45 Telematics is an interdisciplinary field that encompasses telecommunications, vehicular technologies, electrical engineering, and computer science.

46 Tortoise Media. (n.d.). The Global AI Index. Available at: https://www.tortoisemedia.com/intelligence/global-ai/

47 Digital Future Index 2021-2022

48 Ibid.

ahead of India (6%), China (5%) and Canada (5%).[49] Of these UK based AI companies, 11.9% of AI companies targeted the professional services sectors.[50]

The levels of AI adoption however does not reflect this scale of development. More recently, efforts have been made to quantify the level of AI adoption in the UK economy, shedding more light on its prevalence across different sectors. Research published in January 2022 on the current scale of AI adoption in the UK found that the current usage of AI is limited to a relative minority of around 15% of businesses in the UK (approximately 430k).[51] Another 350k businesses are either piloting AI technologies (2%) or are planning to adopt them in the future (10%). Notably however, the levels of investment into AI solutions has been growing significantly in certain sectors and spending on AI in the professional services sectors is estimated to increase over 30% between 2021 and 2025 (CAGR).[52]

Although actual AI adoption is still somewhat limited today, there are specific sectors as well as larger businesses where uptake is more prevalent. Variation also exists according to business size, as large companies in the UK were recently found to be twice as likely to have adopted AI compared to medium-sized companies who, in turn, were approximately twice as likely to have adopted AI compared to small businesses.[53]

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49 Digital Future Index 2021-2022

50 https://www.digicatapult.org.uk/wp-content/uploads/2021/11/Digital_Future_Index_2021_2022_-_Digital_Catapult.pdf

51 15% of the UK's 2.8m private businesses have adopted at least one AI technology.

52 IDC (2022) Spending on Artificial Intelligence Solutions Will Double in the United States by 2025, available: https://www.idc.com/getdoc.jsp?containerId=prUS48958822

53 Capital Economics (2022) AI activity in UK businesses https://www.gov.uk/government/publications/ai-activity-in-uk-businesses

3   The ISCF Next Generation Services programme

3.1   Theory of change

Our analysis of the impact of the programme follows the logic model and theory of change developed as part of the study's evaluation framework. The logic model of the programme developed for the evaluation (Figure 2) maps the expected chain of events through project activities to outputs, outcomes, and eventually impacts, while the Theory of Change (ToC) of the programme articulates the implicit and explicit rationale and assumptions, and how one could reasonably expect the changes to unfold. For the evaluation we have unpacked each of these and tested our initial assumptions, drawing from the data collected and different methodological tools deployed.

Figure 2 ISCF NGS Theory of Change
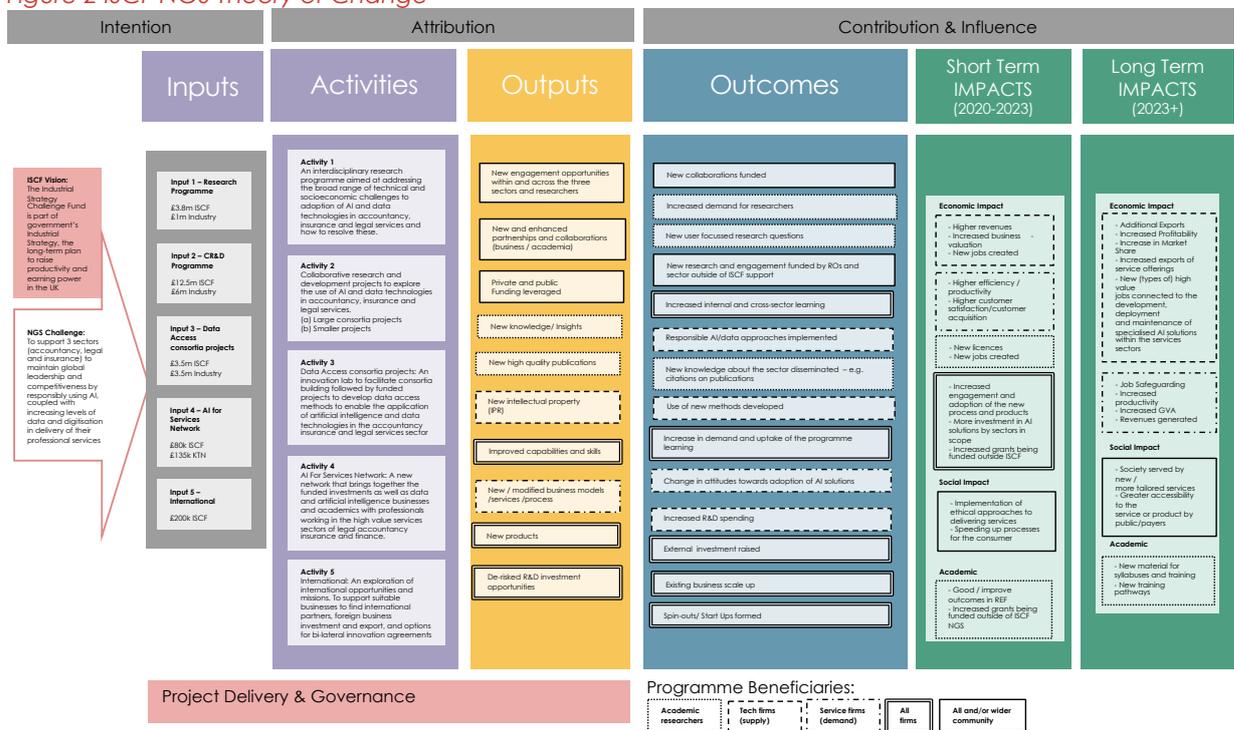
For reasons of clarity and presentation, we have organised the presentation of outputs and outcomes emerging from the programme into five large areas of analysis. These are:

- Engagement, partnerships and collaborations
- Investment, funding and leverage
- New knowledge production and dissemination
- Skills, capabilities and attitudes towards AI
- Innovations and new economic activity

For each of them we have mobilised all the data sources and methods of the study, with the objective of compiling evidence of impact of the programme, and comparison against a suitable counterfactual constructed from unsuccessful applicants (for the indicators and areas of analysis where this makes sense).

Before presenting the outcomes and impacts of the programme, we present a summary of the information on programme inputs and activities, so that results can be put in context with the size and scope of the interventions carried out.

3.2 The ISCF NGS programme portfolio

The ISCF NGS programme started in April 2018, with grants awarded from December 2018. The programme ran until March 2022. Its activities were delivered across five different strands, namely Collaborative R&D grants (managed by IUK), Data Access grants (managed by IUK), Research Programme grants (managed by ESRC), the AI for services network (managed by the KTN), and the International activities strand. Collaborative R&D grants comprised the majority of the programme funding (64% of all grant funding).

Since its inception, the ISCF NGS spent a total of £20.3m in grant funding across five different strands (Table 2) and a further £1.69m for programme delivery. The objective of the programme was to support projects exploring how AI can transform the sectors of insurance, legal services and accounting, with a goal to support these sectors to become more efficient, productive and competitive. The programme also supported technology providers in the areas of AI, data analytics and software, in engaging and developing new products, services and solutions for these three end-user sectors.

Table 1 Next Generation Services – List of activities

Activity	Action	Objective	Timeframe	Budget	Implementation grants
Interdisciplinary research	Academic research programmes.	3 programmes studying the challenges of adopting AI and data in accountancy, insurance and legal services.	Jan 2019 – December 2021	£4.2m ISCF £1.8m Industry	3 ESRC grants (£750k-£1m ISCF) 8 top-ups to the 3 ESRC grants (£30k-200k ISCF, using the same grant code as the three large grants)
Collaborative R&D	R&D activities for the adoption of AI tech.	4 large consortia address challenges that require systemic changes; 33 small consortia focused on AI tech adoption in firms	April 2019 – December 2021	£11.8m ISCF £6m Industry	4 CR&D large grants 33 small grants
Data access	Running an Innovation lab and R&D activities for the development of data access models.	3 projects developing data access methods to enable the application of AI and data tech in the accountancy, insurance and legal services sector.	March 2020 – March 2022	£4.1m ISCF £5.5m Industry	4 CR&D data access grants
AI for services network	Networking activities.	Bringing together the organisations funded under the NGS and other relevant stakeholders.	June 2019 – March 2021	£80k ISCF £135k KTN	N/A
International activities	International visits	Exploration of international opportunities and showcase new UK solutions.	Aug 2019 – Dec 2020	£219k ISCF	N/A

Source: Technopolis 2022, ISCF NGS programme data. Values include accruals.

3.2.1 Collaborative R&D

The collaborative R&D portion of the ISCF Next Generation Services Programme (ISCF NGS) was comprised of three primary strands:

- CR&D Large Consortia
- CR&D Small Consortia
- CR&D data Access

Across all strands 40 projects were supported through the ISCF NGS programme.[54] The largest proportion of projects were funded within the CR&D Small Consortia Strand (29). Despite the large numbers, the CR&D Small Consortia strand received less funding than the CR&D Large Consortia projects. The average grant per participant within the CR&D Small Consortia strand was smallest across the three strands. The large consortia CR&D strand saw the largest averages, while also receiving the largest proportion of funding in this part of the programme.

Table 2 Grants and investments per ISCF NGS CR&D programme strand

Strand	Number of projects	Overall grant offer (total)	Average grant per project
CR&D Large	4	£6.08m	£1.54m
CR&D Small	32	£5.71m	£0.16m
CR&D Data Access	4	£4.07m	£1.02m

Source: Technopolis 2022, ISCF NGS programme data. Values include accruals.

The table below provides an overview of the number of unique participating organisations within each CR&D strand of the programme. The majority of participants are businesses (76% of participants) with research organisations (academic institutions) accounting for 18% and RTOs accounting for 5%. Of note, 80% of the business participants in the programme are new to Innovate UK.

Table 3 Participants in the ISCF NGS, by strand

Strand	Research	RTO	Business	Total
CR&D Large Consortia	4	0	12	16
CR&D Small Consortia	7	4	42	53
CR&D Data Access	6	1	18	25

Source: Technopolis 2022, ISCF NGS programme data

Of the participating organisations, there was surprisingly little overlap within each strand, and within the programme at large. Only a single company had two projects within a single strand. Across strands, only 2 research organisations (universities) were participants in more than one project, with each participating in 2 projects. Overall, more than 96% of the participants were unique, a surprisingly high percentage. Of the 82 project participants, 79 were unique, with the breakdown provided below.

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54 Of the 41 projects that were offered funding across the CR&D strands, four were 'terminated early'

Table 4 Unique participants within the ISCF NGS programme

	Research	RTO	Business	Total
Unique participants	15	5	59	79

Source: Technopolis 2022, ISCF NGS programme data

When examining the size of the participants in each strand, there are a few points of interest. Within the CR&D strands there was a clear preference of small/micro businesses participating in the Small consortia projects, with only 15% of small/micro participants in the Data Access Strand and 13% in the Large Consortia strand. For the other sized businesses, their participation was varied across all strands, although Medium sized enterprises appear to be under-represented overall. RTOs were most represented in the Small Consortia strand, with no participations in the large consortia projects and only one in the Data Access strand.

Table 5 Participants in the ISCF NGS by size and strand

Strand	Academic	RTO	Business		
			Large	Medium	Small/Micro
CR&D Large Consortia	4	0	3	1	7
CR&D Small Consortia	7	4	5	2	32
CR&D Data Access	6	1	1	0	9
Total	17	5	15	3	48

Source: Technopolis 2022, ISCF NGS programme data, RTO includes Public sector, charity or nonJe-S registered research organisations

3.2.2 Research Projects

The interdisciplinary research strand was an impact led interdisciplinary research programme managed by ESRC and funded with £4.17m from ISCF NGS.

It supported research to understand and investigate the potential behavioural and socio-technical challenges to adoption of AI and data technologies in the sectors in scope. The interdisciplinary research programme focused more on studies that "identify more specifically the challenges, obstacles and frictions that, if addressed, are likely to speed up adoption and diffusion" of the technologies and propose options that industry can implement.

Ultimately, the strand funded 3 research projects, each of which have been profiled as part of this study.

3.2.3 AI for Services network

The AI for Services network aimed to bring together the stakeholders within the sectors in scope into a single network to facilitate multi-disciplinary and cross-sector discussions, covering from technology to other topics in scope such as human factors and ethics. The network has been growing and now has more than 1,400 members including organisations such as Allen & Overy,

The Alan Turing Institute, The Office for Artificial Intelligence, BDO and Brit Plc.[55] Key activities within the AI for Services Network included:

- newsletters with relevant sources of information
- invitations and promotion of events and webinars
- sharing of success stories with the community
- hosting of activities, in collaboration with others

3.2.4   International Activities

Activities included Global Technology Reports, Global Expert Missions and Global Business Innovation Programmes (GBIP). Overall, the objectives of these activities can be divided into two categories, promoting UK businesses abroad and providing insight into potential international markets and predictions on how technology will progress. All of these activities were hampered by the pandemic, although some alternative solutions were found in the interim. Ultimately, a single in person international mission to Singapore was undertaken, in addition to a Global Technology report commissioned by Innovate UK for Hungary/Poland, and two Global Expert missions. Of the two Global Expert Missions, one was undertaken virtually to Singapore (December 2021-January 2022), with the second being an in-person mission to Canada (March 2022). The outputs of these missions are expected to be produced and shared in latter part of 2022.

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55 http://aiforservices.org/

4   Main findings

4.1   Engagement, partnerships and collaborations

This section covers the indicators related to collaborations and partnerships secured due to participation in the programme.

The programme has fostered new engagement opportunities through participation in networking events and other activities. These may lead to further collaborations or the identification of commercial leads and future opportunities. Figure 3 shows that the programme has supported both participants and unsuccessful applicants to form new relationships with different partner types. The average number of new partnerships with customers or end-users is 2.4 for participants and 1.5 for unsuccessful applicants. When asked about the contribution of the programme, 77% (base: 69) of participants and 53% (base: 101) of unsuccessful applicants said that the programme was a catalyst for the establishment of their new partnerships (to a large or to some extent).

At the close of their NGS projects, 87% participants were satisfied with the effectiveness of their consortia, with 58% indicating they were very satisfied (project completion forms, base:48). The majority also indicated they expected to collaborate with these partners again in future (73%).

Furthermore, 25% of participants and 23% of unsuccessful applicants indicate that these new partnerships and collaborations have resulted in access to further funding (beyond the ISCF NGS grant) to support their activities.

Figure 3 Average number of new partnerships per partner types
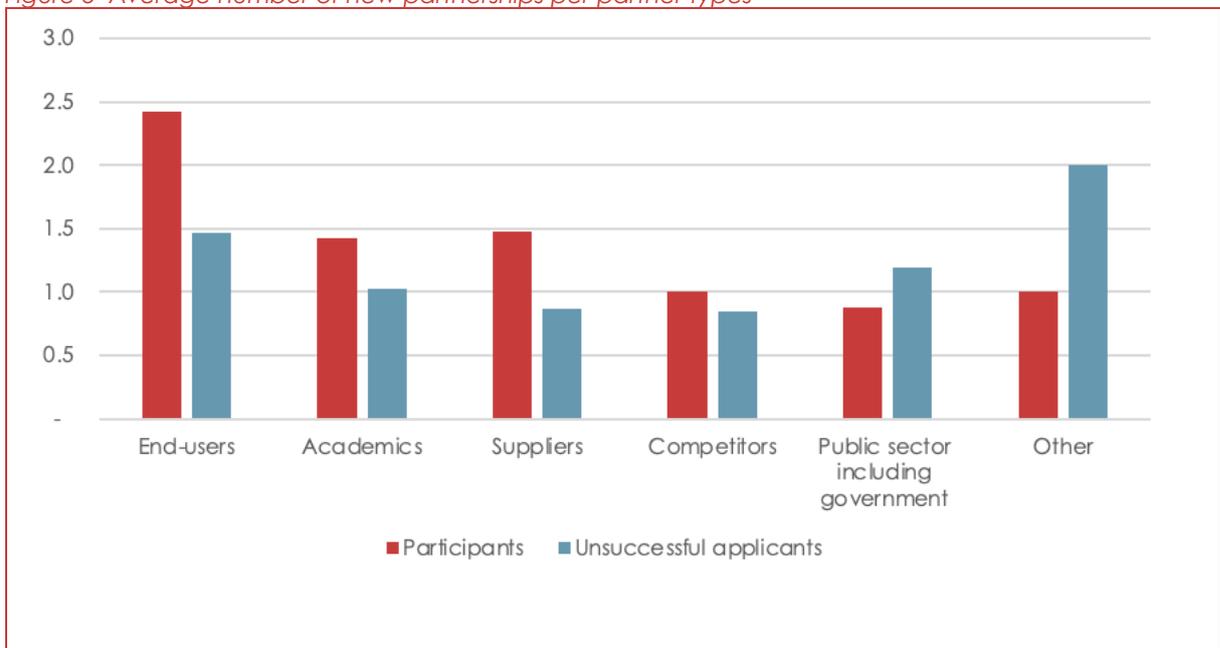
Source: Technopolis survey data, 2022. Participants base: 32 (end-users) – 2 (other); Unsuccessful applicant base: 49 (academia) – 4 (other).

The boxes below present two examples from the case studies of how the programme is supporting the development of new collaborations and partnerships.

Box 1 Case study summary: Innovating Next Generation Services through Collaborative Design

Case Study: Creating new opportunities for knowledge exchange

Project: Innovating Next Generation Services through Collaborative Design

Professional service firms are under pressure to adapt their existing business models in the face of new AI technologies, particularly their revenue models. As a result, companies need to think carefully and strategically about organisational change. This NGS funded research project brings together design thinking, machine learning, management innovation and professional services to examine the added value of AI technologies to mid-market accounting and law firms while providing tools for businesses to use collaboration design models to inform their current and future pathways for AI adoption. The project consortium is comprised of a cross-disciplinary team of academics from five UK Universities, including both new and existing research partners, strategy consulting firm Normann Partners alongside sector representatives and membership organisations (the Managing Partners Forum, Litig and The City UK).

Driven by academic research, the project has developed a Business Model Innovation & AI readiness toolkit and is delivering design sprint workshops with legal and accountancy firms to apply and further develop the toolkit. The project is actively seeking to build new relationships with firms to participate in these workshops and thus far has engaged ~25 firms in multi-firm design sprints and delivered eight bespoke, firm-based design sprints. The sprints received positive feedback, with indications from participants they will take forward the solutions developed and in some cases the project team have been invited to support the companies further in the development and adoption. The professional service industry is still only exploring the application of AI and such projects are an important step in the knowledge exchange that can then evolve into actual AI application.

Consortia partners have also been building partnerships with business and academia through regular, informal meetings with the other research projects to share experiences and learning from across the sectors and an additional project in collaboration with the TECHNGI research project, and as a partner in the CR&D project in collaboration with Engine B. The project has also launched a series of webinars, disseminated through the AI for Services network, to disseminate findings of the project and is leveraging new and existing partnerships with industry to present their experiences through these webinars. The project team also delivered an event in September 2020 to engage with the firms participating in NGS CR&D projects. Further collaborations are being explored to expand the project's reach into new areas. These are likely to include academic pursuits, including the development of a paid educational course for companies seeking to better engage with next generation services implementation and the publication of two books.

Box 2 Case study summary: SERI

Developing standards for new categories of products within the Insurance sector

Project: Standard for Environment, Risk and Insurance

For centuries insurance has been centred around the standardisation of risk. Climate change has thrown that long-standing model into disarray, as a rapidly changing world becomes increasing difficult to model, and insurance businesses have limited experience in determining the risks associated with the changes that are taking place around the world. Despite the difficulties, more companies in all sectors of the economy are becoming more concerned with the risk of environmental damage. Within the insurance sector, data is key to the proper underwriting of risk for clients, often using the last 10 years to predict what will occur in the future. Complex climate modelling, often looking years into the future, creates a new challenge by requiring firms to incorporate future data into their systems. The complexity of this future data means that firms can no longer solely rely on low level employees to input the data manually into proprietary data systems.

This project, working toward a Standard for Environment, Risk and Insurance (SERI), is trying to bring together companies across the insurance sector to offer standard protocols and data sharing pathways for products related to climate. This requires a sharing of ideas, practices and proprietary data between rivals. The team worked with the insurance industry partners to develop the necessary protocols before weekly iterations of potential climate related products for commercial application. All partners were involved in this work through large scale advisory groups and working groups to ensure that the industry inputs were accurate combined and respected. The project selected a single product which is in the early stages of commercialisation, Climate Building Passports, designed to capture and share data on a building's life cycle (design, build, operation) and provide owners a means to reduce greenhouse gas emissions.

Icebreaker One, a not-for-profit organisation whose founder had experience in developing open banking standards in the UK, is the lead on this project. The work on previous standards development, enabled key personal links to large insurance companies, encouraging companies like Lloyds Register, Aon UK, Ove Arup, Willis Towers Watson and Agvesto to join as partners to the project early on. Other partners include the law firm Bird &

Bird LLP as well as the financial services firm Dais Partnership LLP. The array of partners, with different interests and backgrounds each provide a unique perspective and play an important role in creating a shared a common practice across the sector. It requires engagement and desire from the entire sector to take up a new standard quickly and efficiently. The project has developed a single model product, based around a common set of protocols that will begin early commercialisation this year. All partners have seen the value in continuing to pursue SERI and all have committed further funds and in-kind contributions to continue the efforts undertaken during the ISCF NGS grant.

For many of the commercial partners, this was the first opportunity for them to engage in this kind of collaborative research, particularly on such grand scale. This has led to the creation of dedicated teams at some of these institutions to drive further innovation and facilitate the integration of new ideas into their organisations. The relationships between the partners have largely survived and have seen multiple collaborations develop as a direct result of their participation in this project. The continued knowledge exchange between the partners is likely to lead to additional benefits in the future. However, given that these remain relatively new components of their businesses, the long-term benefits are as yet unrealised.

For participants in the **Global Business Innovation Programme** (GBIP) Singapore mission in 2019, respondents to the EEN survey following the mission indicated that making new contacts was the most impactful element of the mission. These new contacts gave them a greater understanding of the Singapore market, and how best to move forward with bringing their product/service to the market overseas. Of the 12 companies that provided data on the number of meetings held during the trip, the highest was 101, with the average being just under 35 meetings per company. Of these meetings roughly half generated some interest and potential for future cooperation.

Since its launch in May 2019, the **AI for Services** network has delivered 34 events with a combined total of over 2,452 attendees (average of over 66 attendees per event). This includes workshops, webinars, networking events, as well as distributing further content through podcasts, broadcasted interviews, and the launch of the AI for Services 2020 Report and the AI for Services 2022 Report (see Table 1). The majority of these events have been delivered online due to the COVID-19 pandemic. Of note, many of these events and dissemination activities have been delivered in collaboration with ISCF NGS funded research projects, providing a platform to showcase participation projects and disseminate findings more widely.

In addition, the AI for Services network has built its online presence and as of November 2021, had 1,432 individuals registered for their mailing list, and as of July 2022 had 250 members on LinkedIn and 357 followers on Twitter.[56]

Table 6 AI for Services network events

Event Type	Number of Events	Attendees (total)
In-person events		
1 day Conference/ Workshop	1	75
3-day residential Innovation Lab	1	53
Networking event	2	114 (average 57)
NGS Showcase Event – a hybrid including launch of AI for Services 2022 report, publication of NGS Projects Brochure and facilitated introductions	1	100+

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56 https://twitter.com/AIForServices

between organisations. The video of the launch has also been viewed 350+ times on YouTube.[57]		
Virtual events		
Webinars / Workshops*	28	2,091 (average of 75)
Networking Specific Events	1	19
Other		
Report publication, interview blog series, podcast	4	N/A

Source: Technopolis summary of KTN data. *One webinar event also included a networking component

As of November 2021, the AI for Services network had facilitated 495 introductions and 15 collaborations. Across the different means of collecting feedback from the AI for Services network membership, around half had identified potential commercial leads due to participation in events organised by the AI for Services network:

- Responses to the telephone survey found that 12 participants (35%) and 4 unsuccessful applicants (9%) have attended events organised by the AI for Services network. From those who have attended, 9 participants (75%) and 2 unsuccessful applicants (50%) have identified potential commercial leads due to their participation in those events.

- Of the members of the AI for Services network surveyed, just under 70% had attended events with just under a third identifying new partners or collaborators (7 organisations), with the same number of organisations initiating new collaborative R&D projects. Five respondents had identified new commercial leads, one of whom had also secured a commercial contract and a further two still in discussion.

- Of the organisations that provided feedback following the 2019 in-person speed networking events, almost half (5 of 12) had found new collaborations because of the matchmaking events, while a further two indicated that they were in ongoing negotiations.

The **Research Projects** have enabled a range of partnerships and collaborations and have successfully engaged a breadth of stakeholder types. These organisations are involved in the NGS research projects in different capacities, with different beneficial effects to flow from their participation. This includes industry partners, regulators, policy makers, and other higher education institutions (HEIs) not funded by ISCF NGS. Within the context of the research projects, these organisations also play a range of different roles, whether it be to contribute data, information or resources, to facilitate networking, or as an 'end-user' of the projects' outputs. Indeed, an organisation could play many different roles at different stages of the project. As demonstrated by the breadth of organisations that responded to the survey of research project participants. This included firms operating in law and legal services, AI/data firms and research organisations were the most common participants.

Of note, the majority of these organisations had not applied to the ISCF NGS programme (67%) which indicates the research projects are also supporting the NGS programme to extend its reach beyond the core participants (base:21).

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57 https://www.youtube.com/watch?v=5OsFLKqCtEk&ab_channel=InnovateUKKTN

Figure 4 Research Projects: participants by main sector of activity
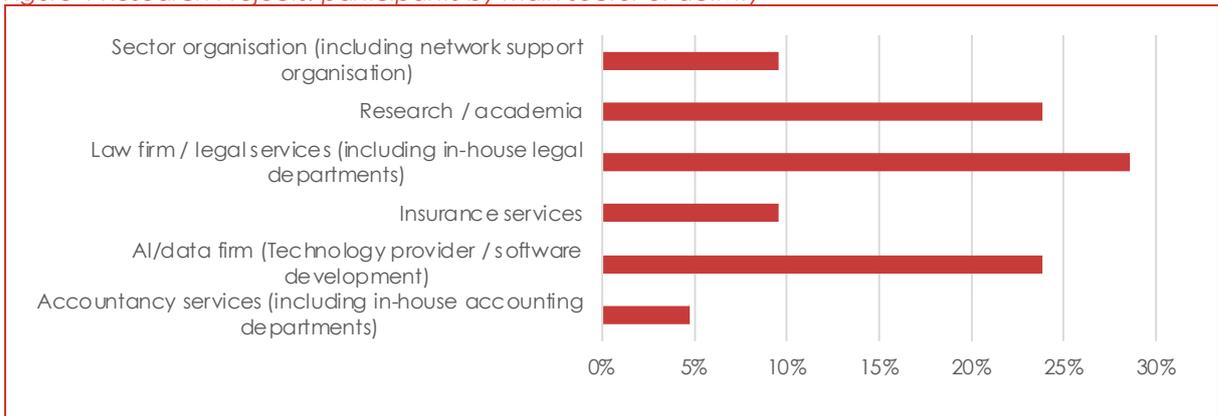
Source: ISCF Next Generation Services Research Project Participant Survey, 2022, base: 21

The research projects reported a total of 39 **collaborations and partnerships**, which made contributions to the tune of £1.83m.[58] This includes £1,817,719 of in-kind contributions and £14,780 of cash co-funding. The majority of these partnerships and collaborations were with private organisations (21), with a further nine academic partners, five with charities / non-profit organisations and one with a public organisation. However, this is **unlikely to capture the full breadth of participants** involved in and benefitting from the research projects.

According to their ResearchFish submissions, the research projects have supported 199 engagement activities between them including contributions to formal working groups, talks and presentations, broadcasts, online publications and participation in wider events (listed in detail in Appendix C and in research project case studies presented in Appendix B).

Each of these participating organisations could also have different 'levels' of engagement, ranging from strong and consistent engagement throughout the project through to those who have read project outputs or attended a single webinar. For example, of the 21 respondents to the research project survey, the majority had engaged with the research through more than one route, primarily through providing data / information (either about their organisation or the sector in general) and attending events/webinars and having informal discussions with the research project team. Whilst some of these organisations are listed as formal partners, many are not, indicating the breadth of reach and potential impact of the research projects will extend beyond their direct partners. Though only one survey respondent had only had 'less formal' and closer interaction with the research project teams (through informal conversations and attending an event), it is unlikely this type of beneficiary would take the time to provide feedback on a survey such as this.

Stakeholder engagement has been a key factor of success for the research projects – not only in achieving the impacts and supporting the introduction AI technologies in the accountancy, legal and insurance sectors, but in understanding the current baseline of using novel technologies in these sectors, the possible demand for AI and challenges of changing business models. These impacts and benefits are explored in more detail in subsequent sections.

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The research projects have facilitated business-academia collaborations, as well as providing a platform to increase connections between sector organisations. Indeed, 83% of participants who responded to the survey indicated the research project had increased their opportunities to share knowledge / experience with the wider community. As a result of their participation in the research projects, all 10 survey respondents from businesses reported new / stronger connections with academic researchers and half reported stronger connections with other stakeholders within their sector / profession or other sectors / professions. All four academic survey respondents reported new or stronger connections with other researchers within their own and other research fields and had also developed stronger connections with stakeholders in the accountancy, legal and insurance sectors.

Table 7 below provides a summary of all the baseline and post-exit indicators on engagement, partnerships and collaborations.

Table 7 Summary of the baseline and post-exit indicators – Engagement, partnerships and collaborations

Indicator [T=treatment (participants) / C = control unsuccessful applicants] [1 Interd. Research / 2 CR&D / 3 Data Access / 4 AI for services / 5 International missions] [Academic / business and successful / unsuccessful]	Strand / Stakeholder [1][2][3][4] / [Academic] [Business X]	Baseline value		Evidence of progress so far	
		T	C	T	C
Number of networking events organised	[2][3] [all]	0*	—	34	—
Number of attendees to networking events	[2][3] [all]	0*	—	2,452	—
% Of attendees who identified potential commercial leads due to participation in events organised by the AI for Services network	[2][3] [all]	0*	—	75%	50%
Number of new customers or end-user partnerships (mean)	[2][3] [all]	0*	—	2.4	1.5
Number of customers or end-user partnerships (mean)	[2][3] [all]	4.2	3.2		
% of organisations indicating that they can see avenues for future collaboration with industry/academia due to the programme	[2][3] [all, successful]	0*	--	75%	—

Number of projects in collaboration with a commercial or industrial partner (mean)	[2][3] [academic, all]	1.6	0.9	1.5	1.2
Number of projects in collaboration with academia (mean)	[2][3] [business, all]	0.5	0.4	1.0	0.4
Number of new collaborations funded (outside of ISCF NGS) (mean)	[2][3] [all]	0*	—	0.7	0.3

Note: 0* (assumes 0 as the baseline position); Note: Excluding outliers defined as values 3 standard deviations away from the mean.

4.2 Investment, funding and leverage

This section covers the indicators related to funding, investment, and leverage obtained thanks to participation in the programme.

4.2.1 Funding

At the point prior to application, the **average investment per organisation** in the development of the project was ~£164k (£3.6m in total, base: 22) for participants and £592k (£7.1m in total, base: 12) for unsuccessful applicants.59

Around 53% of unsuccessful applicants terminated their project after their application for an NGS grant was unsuccessful, and a further 38% continued the project activities with reduced scale, scope, or with a delay. For participants, the results are almost identical: 57% said that they would not have continued the project activities without the funding and 39% said they would have continued but with a reduced scope, scale, or with a delay.

Those unsuccessful organisations that continued their projects have invested a further £344k on average (£4.1m in total, base:12). For participants, the average level of investment is higher, at £546k (£17.5m in total, base:22) per organisation. If this were to hold across the 52 unique participating businesses in the ISCF NGS programme, then the total cumulative investment would equate to around £28m. For those companies that proceeded with the project, the majority used their own resources. Only 25% of unsuccessful applicants reported that they obtained other private or public funding (outside of the NGS grant), compared to 50% of participants.

As to why unsuccessful applicants did not continue with their proposed projects and/or decreased their investments, there are various possible reasons. Following an unsuccessful application, companies could have recognised that the proposed project was not viable, signalling that the programme's selection process was effective in identifying solutions with stronger prospects. Alternatively, the projects may not have progressed in those cases where funding from the programme was indeed critical, and no other sources were identified or

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59 To allow for an easy comparison between the baseline and progress to date, the sample is restricted to only those survey respondents who have provided information for both periods. To test the robustness of the results and to increase the sample size, we also re-calculated the progress to date figures using data from either the interim (2020/21) or final (2021/22) survey.

The results indicate that the average investment per organisation in the development of the project has increased for participants, from £134k (£4m in total, base: 30) prior to the programme to £441k (£19m in total, base: 31). In contrast, for unsuccessful applicants, the value has decreased from £325k (£9m in total, base: 31) prior to the programme to £238k (£5m in total, base: 21). The drop for unsuccessful applicants seems to be smaller if we utilise responses from 2020/21 as opposed to using data only from the final survey.

secured. Finally, some organisations may, having not secured the funding and commitment of the grant, needed to divert their attention and investments to other areas of the business.

4.2.2 Investment

One of the headline outcomes expected to emerge from the ISCF NGS programme include higher levels of R&D spending to further progress the development (and implementation) of AI solutions.

On average, programme participants reported **R&D expenditure** of £1.2m (base: 22), a significant increase since the baseline position of £172k (base: 22). Unsuccessful applicants also experienced an increase in the average value of R&D expenditure, rising, from £240k (base: 21) prior to the programme to ~£1.5m (base: 21) in 2021/22. While the average figures provide insightful comparisons, it should be noted that the companies in the sample range significantly below and above these averages. When we consider the median values, we observe a similar substantial increase in R&D spending for both participants (£100k to £605k) and unsuccessful applicants (£76k to £110k).

To build a more comprehensive understanding, we show the distribution of **R&D expenditure dedicated to AI and data applications** in the NGS end-user sectors in the financial year prior to application (i.e., the baseline) and more recently in 2021/22, as well as the absolute change in values between the two periods. As shown, a significantly higher share of participants reported an increase in the value of R&D expenditure in data and AI compared to unsuccessful applicants (77% vs 50%). Participants' average expenditure on AI R&D with a focus on the service sector has increased from £99k at the baseline to £628k, significantly higher than that of unsuccessful applicants (£86k to £183k).

Figure 6 Distribution of business R&D expenditure related to the development of data/AI solutions with applications to the accountancy, insurance, and legal sectors

Distribution of R&D expenditure in data/AI with applications in service sectors in the 2021/22 financial year

Distribution of absolute changes in R&D expenditure in data/AI with applications in service sectors
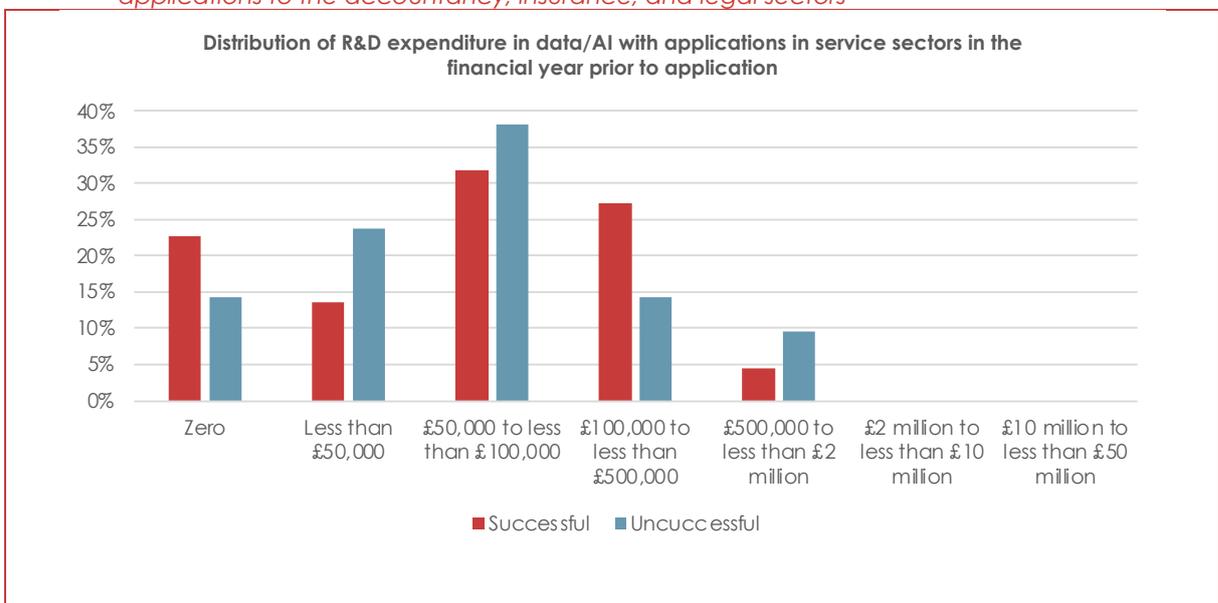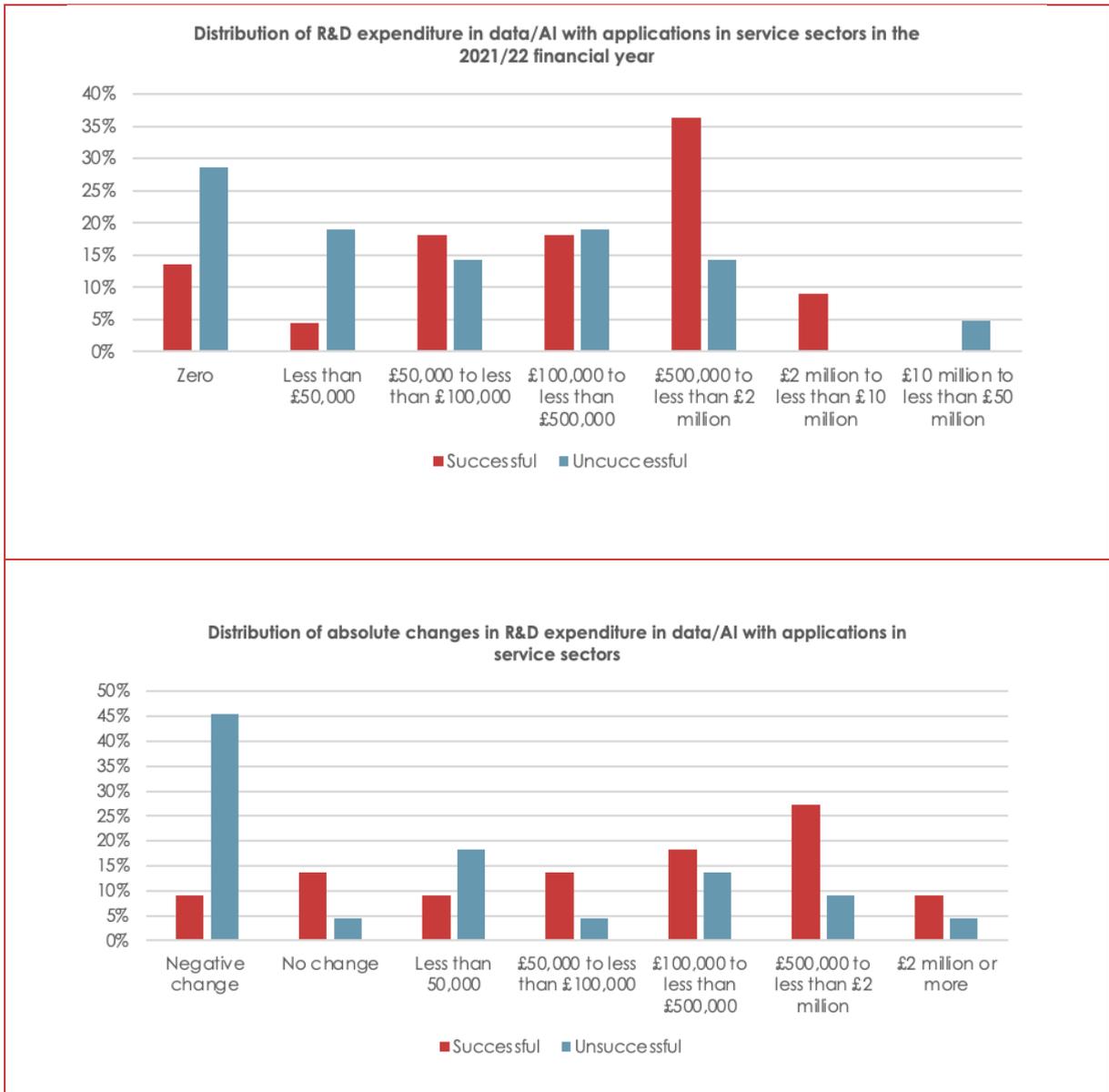
Source: Technopolis survey data, 2022; Participants, base:22; Unsuccessful applicants, base:21; Note that the results are based on the number of numeric responses reported by surveyed organisations, as well as estimated mid-points between reported ranges.

4.2.3 Leverage

The programme aimed to create **de-risked R&D investment opportunities** or, in other words, to make solutions supported by the programme more investable by private sector actors for further development. According to the survey, 91% of participants believe that the NGS programme has made the solutions developed more ready for further investment from the private sector (to a large or to some extent).

We use a secondary data source, Pitchbook, to measure the number of businesses that have secured at least one **external investment deal**. We also present the distribution of the total value raised to date to give an indication of the size of those deals.

In Pitchbook, we compared participating businesses that had completed at least one deal, against unsuccessful applicants. This ultimately led to a pool of 37 participating businesses that

had completed a total of 99 deals compared to 26 unsuccessful applicants who had completed 81 deals.

As Pitchbook conducts a process of identifying companies that are involved in or a recipient of at least one investment deal at some point in time, the presence of companies on the database can also be interpreted as a positive signal of the strength of companies. Half of participating businesses are registered on the database (50% of 71 unique companies) compared to only 15% of the 185 unsuccessful applicants.

Number of businesses that secured deals

Prior to the programme, the number of businesses that had secured deals increased sharply and peaked in 2017 and 2018 (see Figure 7). For the 2013 - 2018 period, participants were more likely than unsuccessful applicants to have secured a deal (73% compared to 70%).

After the start of the NGS programme, the number of businesses that completed an investment deal has fallen for both NGS participants and unsuccessful applicants. For the programme period (2018 – 2021) 80% of participants secured a deal compared to 77% of unsuccessful applicants. Relative to the entire pool of applicants to the programme, during the programme period, 22% of participants (base: 72) signed at least one deal compared to 7% of unsuccessful applicants (base:185).

This decline since 2019 can largely be attributed to COVID-19 and the retrenchment of the investment community during the pandemic. Although deals were continuing, the increased uncertainty meant that fewer deals were completed in 2020 and 2021. Although not shown in the figure below, the 2022 data indicates that both participant and non-participant groups are on track to match 2021 levels in terms of the number of deals, although that is not guaranteed.

Figure 7 Number of businesses with at least one external investment deal, 2013 – 2021
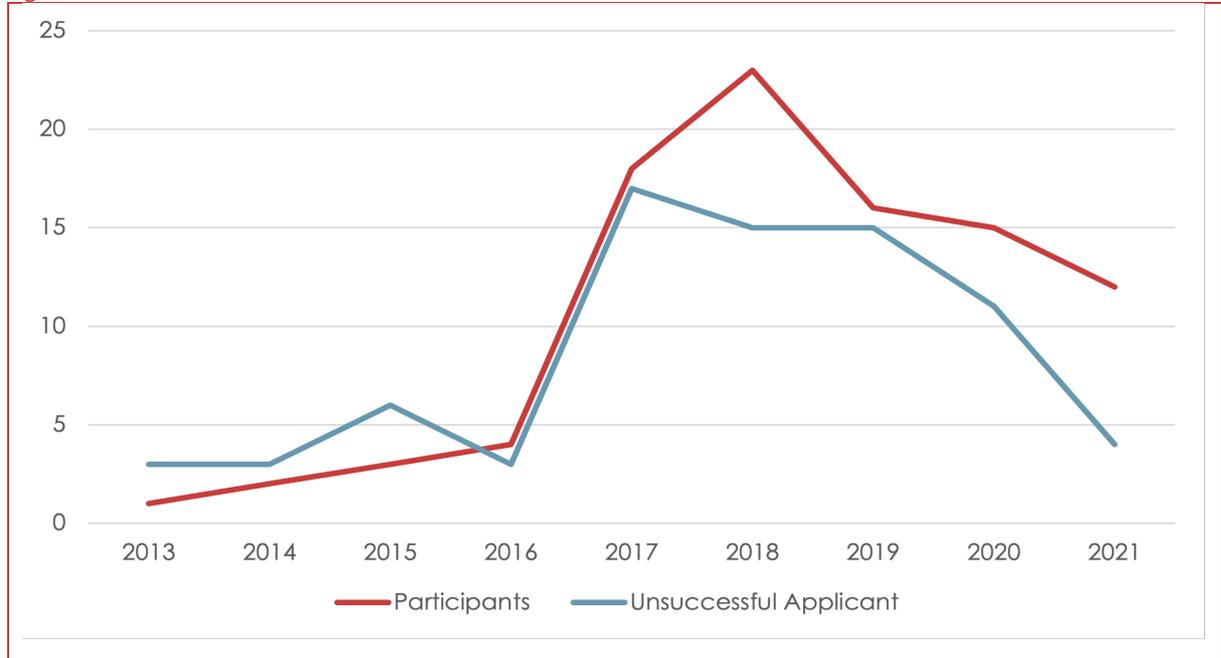
Source: Pitchbook; Participants, base:37; Unsuccessful applicants, base:26

Total number of deals

Though the number of deals has dropped since 2018, the number of deals on average per year between the baseline period (2013-2018) and the active ISCF NGS period (2019-2022) has increased from 16.3 to 20.5 per year. This increase was more substantial for programme participants, where the increase in the number of deals went from 8.5 on average per year to 12. By contrast, unsuccessful applicants stayed at the same levels and secured an average of 7.8 deals per year prior to the programme and 8.5 number of deals during the programme period.

Table 8 Number of deals for baseline and programme period

	Baseline (2013 – 2018)			Programme period (2019 – 2022)		
	Count	%	Average per year	Count	%	Average per year
Total	98		16.3	82		20.5
NGS Participants	51	52%	8.5	48	59%	12
Unsuccessful applicants	47	48%	7.8	34	41%	8.5

Source: Pitchbook; Participants, base:37; Unsuccessful applicants, base:26

Types of deals

When examining the types of deals that are being completed, we can see some clear trends between the baseline period (2013-2018) and the active ISCF NGS period (2019-2022). Across all deal types during the baseline period, except for both Early and Later stage VC deals, the participants and non-participants were in relative parity with each other. Accelerator/Incubator and Grant funding represented the highest proportion of deals within both groups.

During the ISCF NGS period, participating firms were more successful in generating inward investment from private funding sources on top of the grant funding through NGS. The participants secured an increased share of early-stage VC, later stage VC, and seed round deals. By contrast, the non-participating firms saw the largest increases in later stage VC deals, which built upon their early-stage VC deals from the baseline period.

The participant group also secured sustained deals from accelerators/incubators from 2017-2020, which declined in the non-participant group to zero by 2020.

Figure 8 Types of deals for participants and non-participants 2013-2022

Participants

Unsuccessful Applicants

Legend:
- Accelerator/Incubator
- Angel (individual)
- Buyout/LBO
- Corporate
- Debt - General
- Early Stage VC
- Equity Crowdfunding
- IPO
- Later Stage VC
- Merger/Acquisition
- PE Growth/Expansion
- Out of Business
- PIPE
- Platform Creation
- Secondary Transaction - Open Market
- Secondary Transaction - Private
- Seed Round
- Share Repurchase
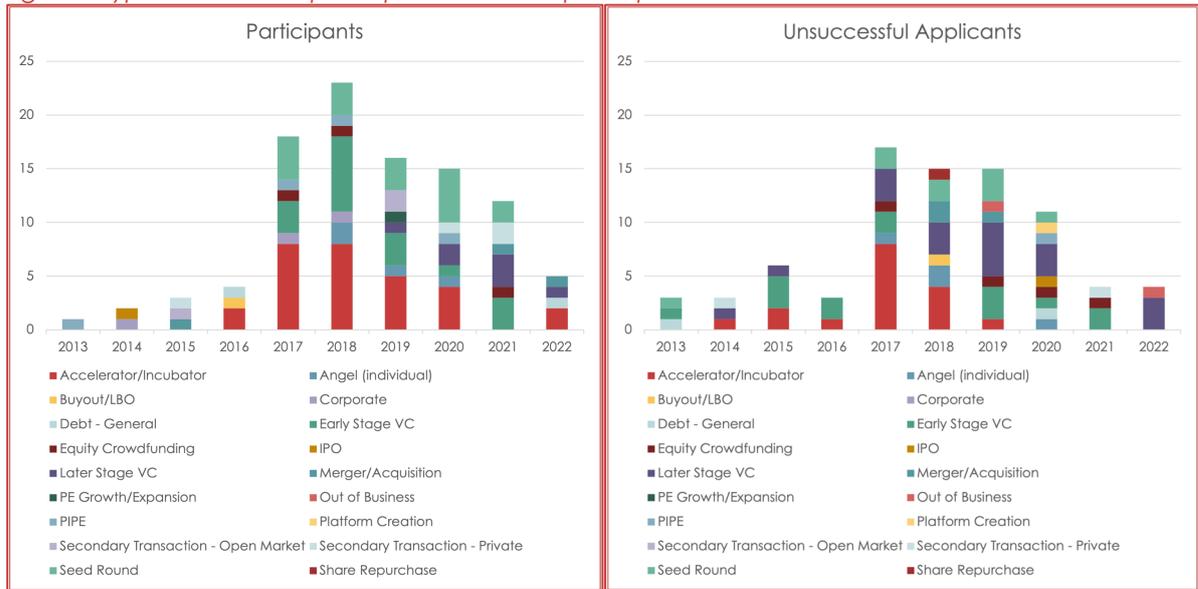
Source: Pitchbook; Participants, base:37; Unsuccessful applicants, base:26

Figure 9 CR&D: Distribution of Deal Type between baseline and active NGS years

Progress to date 2019-2022

Baseline Period 2013-2018

Legend: Participant, Unsuccessful Applicant

Source: Pitchbook; Participants, base:37; Unsuccessful applicants, base:26

Value of external equity investments

The median value of external equity investments has increased for both participants (from £250k to £1m) and unsuccessful applicants (£500k to £780k).

Deal values vary significantly from year to year, and between companies. In the figure below, we show the distribution of deal values for the baseline year and progress to date. We are unable to determine whether these changes are due to involvement in the programme or other external factors. For participating firms, the percentage of deals under £1m has remained relatively constant between the baseline period and the NGS programme period (from 68% to 67%). For the same periods, unsuccessful applicants saw this percentage fall from 72% to 52% indicating some larger deals for these firms.

Figure 10 CR&D Projects: Distribution of deal value (in the baseline period and progress to date)

Source: Pitchbook, Baseline period, (participants, deals: 45 and unsuccessful, deals: 39) Progress to date (participants, deals: 57 and unsuccessful, deals: 39)

Box 3 Case study summary: KnowRisk SC

Participation in the innovation lab as a key to raise external investment for the project

Project: *KnowRisk SC – Fusing data from Industry, Accounting, Insurance and Law to better identify, monitor and manage risk across entire supply chains*

£ In today's globalised business landscape, large companies rely on complex supply chains, where a small change in one can result in significant disruption to other parties. Provisioning for these risks from an accounting/audit, insurance and legal standpoint is dependent upon access to accurate and timely data to understand a client's exposure, liabilities and obligations. Companies and leading accounting, insurance and legal (AIL) professionals are striving to move towards more real-time risk-management to improve productivity and efficiency.

Sweetbridge, the lead partner, is an SME that specialises in standardizing and automating financial process audits and fraud prevention, using blockchain technology. They have partnered with Intelligent AI, the Digital Catapult, Engine B, Cystellar and Industria Risk Insurance Systems to deliver this Data Access project. The objective of the project was to develop an open-source proof of concept Blockchain-distributed Ledger risk management platform to share data along a supply chain in real time. The platform is integrated with standards, data sharing and access control policies for risk identification, legal agreements, accounting, continuous assurance and risk management. This has the potential to reduce the cost of insurance by an estimated 20% and risk exposure by 50% to 80%. Although not expected to be fully commercialised for another two years, the team has already begun commercial testing with one of the largest insurance companies in the UK. The success of the project has also spilled over into other Sweetbridge projects, enhancing other projects and commercial and governmental partnerships internationally.

Due in part to the disruption caused by COVID-19, the project has received significant interest from industry and Government who have expressed willingness to continue its development beyond the NGS grant. The project was formed following the NGS Innovation Lab, through which the partners connected with Intelligent AI. The partners received encouragement and positive feedback on their ideas at the NGS lab from multiple AIL parties. The

feedback enabled the parties to obtain support from their investors which was critical to the provision of matching funds. Without the NGS Lab the consortium might not have been successfully formed.

Sweetbridge is now backed by Symvan capital Ltd. A fund manager that specialises in technology EIS funds, having raised ~£650k in April 2019 through the fund from private investors. Symvan have provided two visibility letters to Sweetbridge, one to obtain their NGS grant and a second as a participant and consortium member of a £1.45m project. Recently, Sweetbridge has acquired B.Heard, another of Symvan's backed companies. This deal was completed as token-for-paper M&A, whereby investors receive Sweetcoin as consideration. Sweetcoin is a securitised token used by Sweetbridge that is part of a loyalty and rewards system. According to Symvan, this is the first deal of its kind in Europe.[60]

Since these earlier deals, Sweetbridge has continued to raise additional funds on capital market. To date, Sweetbridge has raised £10 million in private sector investment to support the activities delivered in this project. These funds have allowed them to hire six more employees and bring the project to the commercialisation phase. The external funds, in addition to the NGS grant have been instrumental in the further development of KnowRisk SC and allows a more rapid and robust entry into the wider insurance marketplace.

Box 4 Examples of further investment

Orbital Witness is using AI to techniques to extract and analyse legal rights and obligations related to property and land. This is intended to supplement and speed up the legal process surround property acquisition or within property disputes. The technology is intended to act in a similar fashion to those seen in credit agencies, so a simple addition to most legal portfolios.

As a result of the programme, they have been able to develop the platform to identify legal issues accurately, dramatically reducing the time a lawyer needs to spend on individual cases. This has the potential to increase profits for users while also reducing potential errors and delays that could occur. The company hopes to expand their offering by incorporating non-legal issues, such as flood risk, in the near future.

The ISCF NGS project increased the commercial potential of Orbital Witness and led them to secure £4m of venture capital. The results of the project have also led the company to begin work with the prestigious 'magic circle' firms, denoting the top 5 multinational law firms based in London.

Genie AI set out to create an industry-wide anonymisation protocol that allows artificial intelligence companies to acquire data safely and develop ground-breaking explainable machine learning models to enable world class services.

As a result of the programme, Genie AI has built working commercial relationships with Barclays and Withers and established long-term plans with many partners to carry on various activities. In particular, Genie AI is now in a position to negotiate a longer-term commercial collaboration with Withers.

Furthermore, through its partnership with Barclays, they have successfully won a space on the Barclays Eagle Labs legaltech incubator. They have also raised a new investment round from Khosla Ventures (as of March 2021). Khosla Ventures is regarded as one of the top 10 VC investors in the world. This has doubled their valuation to £10 million.

InsurTechnix Limited sought to develop a product that transforms raw data into actionable insights to provide cyber security alerts and to drive cyber insurance underwriting decisions.

The work produced through the project had a significant impact on InsurTechnix Limited's external relationships. During the project, they signed a strategic partnership agreement with Duck Creek Technology (DCT), a global provider of cloud-based insurance software solutions, and a leader in Gartner high performant quartile. They have also partnered with an UK analytics business, World Programming Limited to develop analytics capabilities. InsurTechnix Limited's company's charter customer is the Cambridge Judge Business School.

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60 MJ Hudson Investment Consulting Limited. Symvan Technology EIS Fund Tax-Advantaged Investments. EIS Review January 2020.

The NGS Research Projects have also enabled the participating academic research groups to secure six further funding grants valued at around £3.7m.[61] Five of these grants were for researchers involved in the Unlocking the Potential of AI for English Law (£1.9m) and includes grants from the European Commission and the Solicitors Regulation Authority (SRA). The sixth grant, for the NextGenPSF project was in fact for one of the NGS funded Data Access projects. In addition, Loughborough University has secured funding from the WTW Research Network to co-fund and cooperatively deliver a mini-centre for doctoral training in industrial and commercial property insurance.

Table 9 below provides a summary of all the baseline and post-exit indicators on Investment, funding and leverage.

Table 9 Summary of the baseline and post-exit indicators – Investment, funding and leverage

Indicator [T=treatment (participants) / C = control unsuccessful applicants] [1 Interd. Research / 2 CR&D / 3 Data Access / 4 AI for services / 5 International missions] [Academic / business and successful / unsuccessful]	Strand / Stakeholder	Baseline value		Post-exit	
		T	C	T	C
Cumulative expenditure in projects (excl. grant value), in £ (mean)	[2][3] [business, all]	~£164k	~£592k	—	—
Cumulative expenditure in projects (excl. grant value), beyond match funding, £ (mean)	[2][3] [business, all]	—	—	~£546k	~£344k
Number of R&D projects, (mean)	[2][3] [business, all]	2	2	4	2
Number of R&D projects in AI with focus in service sectors, (mean)	[2][3] [business, all]	1	1	2	2
Value of R&D expenditure, £ (mean)	[2][3] [business, all]	£172k	£240k	£1.2m	£1.5m
Value of R&D expenditure, £ (median)	[2][3] [business, all]	£100k	£78k	£605k	£110k
Value of R&D expenditure in AI with focus in service sector, £ (mean)	[2][3] [business, all, successful]	£99k	£86k	£628k	£183k
Value of R&D expenditure in AI with focus in service sector, £ (median)	[2][3] [business, all, successful]	£63k	£68k	£275k	£50k

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Value of annual equity investment raised by applicants, £ (sum)	[2][3] [business, all]	£6.1b	£609m	£120m	£145m
Value of annual equity investment raised by applicants, £ (mean)	[2][3] [business, all]	£84m	£3.6m	£2.1m	£3.92m
Value of annual equity investment raised by applicants, £ (median)	[2][3] [business, all]	£250k	£500k	£1m	£780k

Note: Excluding outliers defined as values 3 standard deviations away from the mean; Note that the results are based on the number of numeric responses reported by surveyed organisations, as well as estimated mid-points between reported ranges.

4.3 New knowledge production and dissemination

This section covers the indicators that measure new knowledge creation accruing from the programme.

The ISCF NGS programme aimed to generate **new and improved knowledge** that will provide practical utility for the project participants, as well as the wider academic and business communities. At the end of their NGS projects, 14 academic participants in the CR&D projects reported in their project completion forms had produced 20 publications and expected to produce a further 21.

To measure the creation of new knowledge since organisations applied to the NGS programme, we surveyed participants and unsuccessful applicants about the number of published think pieces (including blogs posts) related to the sectors in scope. On average, participants published 9.7 think pieces since applying to the programme, up from 6.6 prior to the programme. The average for unsuccessful applicants is lower 5.5 in the last year, down from 7.4 prior to the programme. This included academic partners that produced publications not originally planned or expected at project outset.

One of the primary objectives of the **Research Projects** was to **develop new knowledge** around the sectors in scope and their readiness for AI/data, specific business challenges and frameworks for adoption etc. At the end of their projects, they had produced a total of 87 publications as well as 20 other forms of codified knowledge / research outputs (see Table 10). This includes journal articles (40), books (3) and book chapters (7), as well as consultancy reports (2), policy briefings (6) and conference proceedings (7) (Full breakdown of publications presented in Appendix C).

Table 10 Research Projects: Codified research outputs

	TECHNGI	NextGenPSF	Unlocking the Potential of AI for English Law	Total
Publications	44	13	30	87
Database and models		1	6	7
Research materials		3		3
Other outputs and knowledge		10		10

Source: Research Project Researchfish submissions 2022

The knowledge and insight stemming from the research projects has also **helped to inform policies** within the UK (for examples, see Table 11 below). As a Pioneer Challenge Fund, the ISCF NGS programme itself has benefited from this insight which in turn have informed the

delivery of the NGS programme and subsequent planning for future activities in this area. Indeed, the programme was designed and delivered by ESRC and IUK to provide such feedback throughout the programme, for example through regular contact with the Research Projects and the inclusion of researchers within the Global Expert Missions. More widely, this knowledge and insight has been carried through the programme team and helped to shape and inform UKRI's (Innovate UK and ESRC's) understanding of the needs and interests of the three professional service sectors in scope.

In addition, the research projects have reported a wider influence on policy and practice in the UK and Europe, including providing written and expert stakeholder evidence to national and European consultations and positions on advisory committees.

Table 11 Research Projects: Contributions to policy

Contribution to policy	Number of contributions	Example(s)
Implementation circular/rapid advice/letter to e.g., Ministry of Health	6	Commissioned Research for Solicitors Regulation Authority feeding into review of Legal Technology regulatory environment An Examination of Real Estate and Advertising Industries Report
Gave evidence to a government review or Participation in a national consultation	4	Written Evidence to House of Commons Justice Committee Court and Tribunal Reforms Inquiry Contribution to UK National Data Strategy Expert Stakeholder in development of European Commission Report on AI in Corporate Governance Response to the European Commission's Consultation on AI
Participation in an advisory committee or guideline committee	3	European Insurance and Occupational Pension Authority (EIOPA) Consultative Expert Group on Digital Ethics in insurance Participation in ESRC Business Engagement Task and Finish Group Convened Seminar for House of Commons Justice Committee on evaluation of court and tribunal reforms
Citation in other policy documents	1	Citation in European Commission Report on AI in Corporate Governance

Source: Research Project ResearchFish Submissions 2022

Notably, the **ISCF NGS programme delivery team** have also made contributions to **cross-Whitehall conversations** more broadly. From within the programme management, the programme team have regular interaction with the Ministry of Justice. As a result of the programme, the Challenge Director has joined the steering group for LawTechUK Sandbox activity which is funded by the MoJ. Connections with BEIS are also embedded within the governance structure of the programme through representation of from the BEIS Professional and Business Services on the Programme Board.

The programme is supporting the development of **Intellectual Property (IP), or exploitable trade secrets** related to the areas in scope. According to their PCFs, most project participants were using existing IP as part of their NGS projects (66% of 59). Of these participants, most of that IP originating from the respondent's organisation (59%) or from within the consortium (23%) (base:39). Only 3% of participants has purchased or licensed their IP from an academic institution, whilst the remaining 15% of participants' IP came from other sources including open-source software, or that the IP was jointly owned by members of the consortium.

On average, programme participants are producing more IP and trade secrets since joining the programme, reporting an increase from 1.0 to 2.2 (base:25). On average, unsuccessful

applicants reported a decrease in the numbers of IP and exploitable trade secrets, from 1.6 at the point of applying to 0.8 in the last year (base:30).

8 participants (36%) have entered into an agreement to license out their intellectual property / trade secret, up from 3 organisations (14%) prior to programme. In comparison, 4 unsuccessful applicants (25%) have secured license agreements, down from 6 organisations (38%) prior to the programme. Further 4 participants and 5 unsuccessful applicants have entered discussions to obtain license agreements since applying to the programme.

Based on information provided by four participants (out of the eight with licence agreements), the combined value of those agreements is £4.2m, compared to £16.8m for the four unsuccessful applicants with license agreements.

The boxes below present examples of the production of new knowledge, followed by Table 12 which provides a summary of all the baseline indicators on new knowledge production and dissemination.

Box 5 Case study summary: TECHNGI

Box 4 Case study: Producing new knowledge and helping companies understand their own internal processes

Project: *Technology Driven Change and Next Generation Insurance Value Chains*

The insurance industry in the UK is the largest in Europe and plays as essential part of the UK's economic strength. AI is rapidly becoming an important technology in the insurance industry with potential for instigating transformative changes that dramatically reshapes the industry. This includes technologies such as machine learning, distributed ledger, automated processing as well as profiling the impact of the rapid increase in the availability of data (e.g., from social media and the 'internet of things') for business analytics and modelling. For the UK to maintain its leading position, companies, regulators and policymakers need a strong understanding of the opportunities and barriers of the AI enabled transformation.

The TECHNGI project aimed to explore AI technology and insurance landscapes to identify current and future applications of this new technology, to model and understand the nature of business transformation in terms of business model process change and innovation, and transformation of the overall insurance value chain. This included identifying and mapping the current landscape and the opportunities, enablers and barriers to adoption and resulted in the development of tools, frameworks that could be utilised to guide business strategy and policy.

The outputs of the project are both engagement with industry partners and academic outputs. At a one day conference in 2019 where the team presented a range of perspectives on the applications of AI for insurance and its implications. had 300+ industry representatives and prompted further contact with the research group. The success of these types of initiatives attracted the attention of policymakers. There is already evidence that this new research is influencing decision making at national level, with the Bank of England and the FCA, as well as at the European level, where the European Insurance and Occupational Pensions Authority's AI and Ethics Committee referenced and used the project's work in recent AI related decisions. The project produced a series of reports and papers. This included 12 detailed case studies, management strategy and policy papers, evaluation of insure-tech start-ups, a readiness assessment tool for organisations and academic publications. The project team have produced 8 publications so far with further work continuing past the project – several research papers submitted to SSRN are being further developed into conference papers and continued collaboration with Willis Towers Watson (project partner) is planned to result into at least another research paper to be submitted for journal publication.

Box 6 Case study summary: To investigate the use of AI techniques to augment the role of legal professionals during negotiation

Case study: Increased understanding and demand for AI solutions in legal services

Project: *To investigate the use of AI techniques to augment the role of legal professions during negotiation*

Negotiation is often a fraught process, one that is embedded with human emotions that can prevent good outcomes. This is particularly the case in family law, where parties have vested interests in the outcome of the proceedings and have complex histories. It can be daunting to monitor and record all communications that take place during a family law case, while also ensuring that both parties are acting in good faith and not enabling coercive or abusive behaviour. Identifying such problematic behaviour would generally need to be carried out by solicitors, which may not be seen as neutral in the eyes of the legal parties.

The goal of this project was to develop the tools necessary for an AI platform to monitor communications and create a comprehensive and neutral record of all communications on a case. The sensitive nature of this work also required that the data not be stored a central server, but on a diffuse network of encrypted systems, adding further complexity. The project was able to demonstrate that their AI solution could create a record of communications in real time, while also detecting coercive and abusive behaviour on test cases. The validation of the model was done by independent legal experts, affirming that the concept can develop further into working prototypes that can be used and tested by legal firms within the UK.

Although initially the COVID-19 pandemic caused problems for Transparently, the lead partner, it has since created new opportunities instead. For the first time the legal sector has been forced into the digital space, with courts and nearly all other meetings requiring remote attendance. Prior to COVID-19, the company had to put significant time and effort into convincing firms that this type of effort brought value, but this has changed dramatically with existing partners wanting to continue development and many others wishing to test the product. The rapid changes to the legal sector created a clearer picture of what opportunities exist beyond working with law firms, with the potential to work within the court system. COVID-19 created such a backlog in the court system that the UK Government has been seeking innovative ways to find efficiencies in the legal process to reduce the backlog in cases. Embedding this system, first in family law and then other legal sectors, would be a far larger potential opportunity than Transparently had initially intended to pursue (with significant potential financial and social impacts).

Table 12 Summary of the baseline and post-exit indicators – new knowledge production & dissemination

Indicator [T=treatment (participants) / C = control unsuccessful applicants] [1 Interd. Research / 2 CR&D / 3 Data Access / 4 AI for services / 5 International missions] [Academic / business and successful / unsuccessful]	Strand / Stakeholder	Baseline value		Post-exit	
		T	C	T	C
Number of think pieces (incl. blogs) published in a year (mean)	[2][3] [all]	6.6	7.4	9.7	5.5
Number of reports published in a year (grey literature) (mean)	[2][3] [all]	4.5	1.6	9.2	4.0
Number of IP and/or exploitable trade secrets developed (mean)	[2][3] [all]	1.0	1.6	2.2	0.8
Percentage of organisations with license agreements	[2][3] [all]	14%	38%	36%	25%

Source: Technopolis survey, 2022. Note: 0* (assumes 0 as the baseline position); Note: Excluding outliers defined as values 3 standard deviations away from the mean.

4.4   Skills, capabilities and attitudes towards AI

In the area of skills, we collated indicators measuring the effects that participation in the programme is having on self-perceived capabilities and attitudes towards AI and sector challenges.

The baseline position for all these indicators is zero because it captures the starting position of participating organisations prior to participation. Therefore, the results of the surveys have captured progress so far, that is, to what extent participants feel they have gained increased skills and capabilities because of participating in the NGS programme.

NGS projects supported the development or improvement of new technical skills and knowledge across all respondents from the CR&D strands. The split between development (47%) and improvement (53%) was nearly equal, indicating that there is already a strong skill base among the participants. Given the need for collaboration on these projects, this is another area that saw significant development and improvements (86%). The most significant improvement by the participants was in the area of business planning (67%), which is unsurprising given the early stage of development that many participants found themselves in at the start of the projects.

Figure 11 CR&D projects: New and improved skills
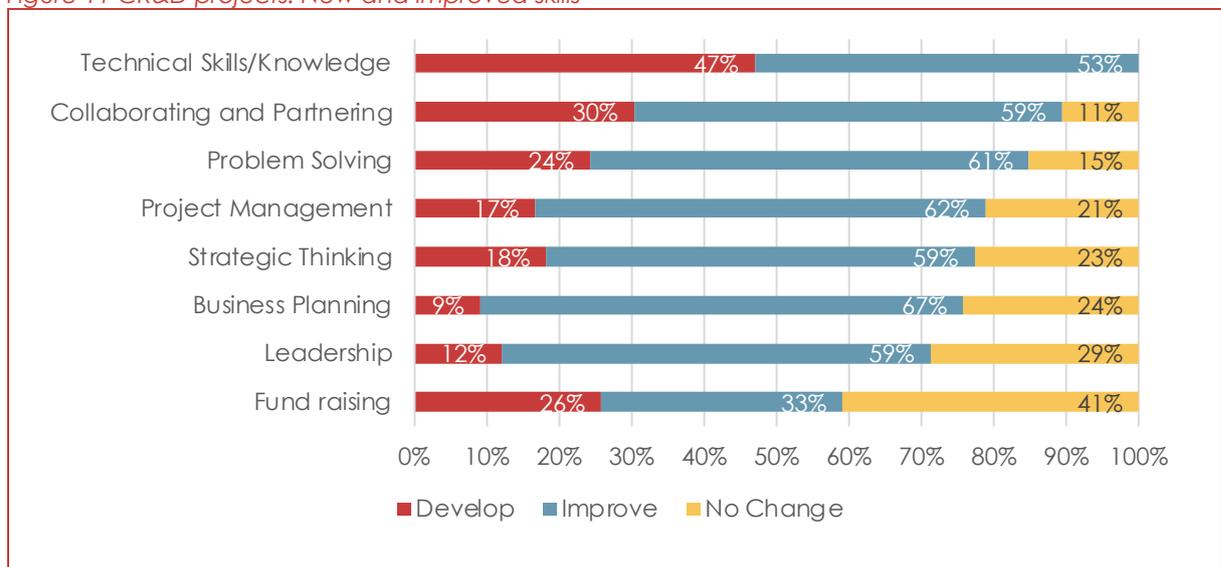
Source: NGS Project Completion Forms base:66

Figure 12 shows that most participants in the CR&D strands think that their involvement in the programme has led to **improved skills and capabilities**. All surveyed technology providers and end-user organisations reported that participation has increased their understanding of the challenges and opportunities related to data/AI and the potential for applying these solutions in specific sectors of activity. Technology providers are slightly more likely than end-users to state that the programme has improved their understanding of sector challenges and opportunities (93% vs 85%) and the potential for applying AI solutions in their specific sector of activity in future (100% vs 91%).
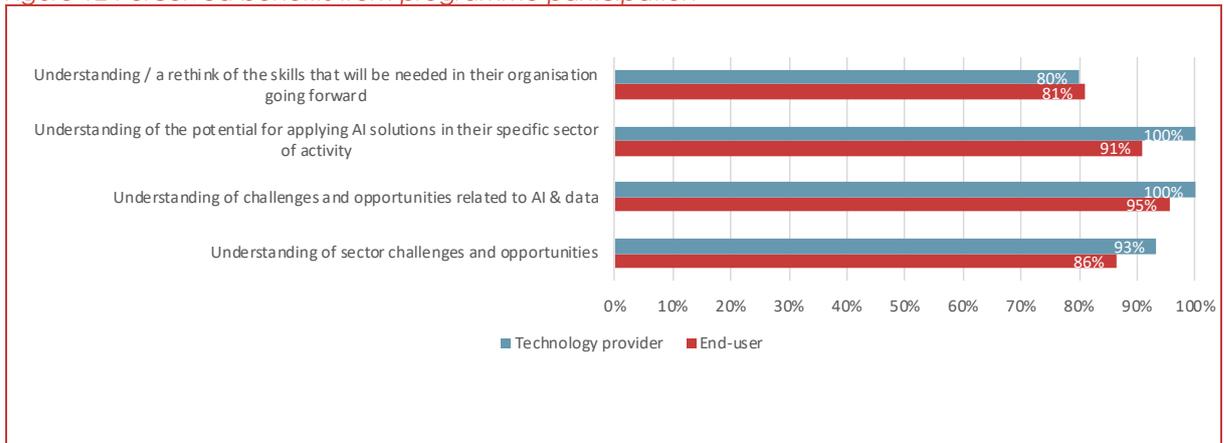
While not related to projects directly, the **AI for Services Network** has also contributed to improved knowledge and understanding within its community. When asked, network members who attended events indicated that they garnered new knowledge and skills due to their participation. Despite already engaging with the network, all participants indicated that it had increased the likelihood that they would pursue a project to develop AI & data related technologies in the future to some degree.

A majority of respondents, (66%) stated that they better understood the challenges and opportunities related to AI to some extent or greater. To a lesser level, nearly half (46%) indicated that their experience increased their understanding of AI & data in their service area. There appears to be less impact when related to understanding one's own business. Both organisational skills and understanding the organisation's approach to integrating AI only saw comparatively limited improvements 'to some extent' or greater, 40% and 35% respectively.

Figure 13 Impact of participation for those who attended AI for Services events

	To a large extent	To some extent	To a limited extent	Not at all
Increased understanding of the challenges and opportunities related to data/AI	33%	33%	20%	13%
An increase in your understanding about subjects relevant to AI&Data in service area (including ethical considerations,…	33%	13%	47%	
Increased the likelihood your organisation will undertake a project to develop or implement AI&Data solutions	29%	29%	43%	
A better understanding of the potential commercial opportunities of applying AI&Data solutions in your specific sector of…	27%	27%	40%	
Increased understanding of the challenges and opportunities in the legal, insurance or accounting sectors	25%	25%	33%	17%
Opportunity to share your knowledge/experience with the wider community	21%	36%	29%	14%
A better understanding of how your organisation could approach adopting AI&Data solutions	20%	20%	40%	20%
A rethink of the skills that will be needed in your organisation going forward	14%	21%	43%	21%

Percentage of respondents

Source: Technopolis, 2022 survey of the AI for Services network. (n=15)

Box 7 Case study summary: Athena

Improved capabilities & skills in both end-user and technology suppliers through *Development and commercialisation of an AI, ML and data enabled online commodity trade finance platform*

Physical commodity trading relies on commodity trade financing, hedging instruments, as well as complex insurance agreements for the materials in transit. Financing is available from banks through commodity trade financing agreements, with the commodity acting as the loan collateral. These are complex legal documents, as the loan collateral -the commodity- is in transit through a variety of different jurisdictions with a wide range of legal systems and risk profiles. There is substantial friction (2 weeks to 2 months to draft a heavily tailored agreement, with significant costs ranging between £10-50k). This means that senior lawyers have to be involved, and small traders are priced out of the market, due to frictions and barriers to entry. This has the potential to create an entire new market of trades ranging between £500k-£1m that would previously been prohibitively expensive to pursue.

The grant lead, Satoshi Ltd., specialises in the development of specialised ERP software for physical commodity traders, and its partner Sullivan & Worcester are a medium-sized law firm with expertise in complex deals that involve all types of commodities, from soft metals to oil and gas. The companies had not worked together before, and as a result of this grant, they have developed a platform (Athena) that leverages AI and machine learning to craft complex legal agreements to facilitate physical commodities trading, potentially opening up new markets within legal services and commodities traders. This new platform pre-populates the necessary documentation from the company's existing ERP and generate a first draft of a financing agreement for a specific trade, hereby streamlining physical commodity trades.

This experience has allowed the partners to improve their capabilities and skills in a number of ways. Data from existing legal agreements has been converted to machine-readable content, using machine learning to break the agreements into clauses and creating a clause repository. This clause repository is being used internally in Sullivan & Worcester to train new staff (for example, involving more junior lawyers in these types of deals) and to

maintain an internal tool for knowledge management (i.e., a machine-readable repository of contract clauses that the law firm can now re-use). The grant has allowed Satoshi Ltd. To venture into the AI / machine learning space. The company is also now venturing into blockchain, with an additional functionality that allows stakeholders along the chain of trade agreements to attest to the authenticity of documents. The company hired a machine learning engineer to apply the right NLP (Natural Language Processing) techniques to develop the pilot for the contract creation tool and is also considering hiring a frontend developer / engineer to make the prototype more easily accessible by third parties, turning it into a cloud-based Software as a Service tool.

Box 8 Case study summary: Smart Policy

Case study: Development of internal capacity to meet new challenges in legal services through *SmartPolicy*

Insurance policies are written with precision, to protect the firms from complex and unforeseen eventualities. Specialised insurance and claims legal firms assist insurance companies in this process, ensuring that the drafting or updating of policies cover the desired risks and that there are no unforeseen legal issues with any new wording. While many insurers work from basic standard contracts, for more specific offerings such as property, financial assets, marine and aviation, new clauses are often added in relation to the type of service being offered. When done manually, this process requires the insurance and legal texts to be compared side by side, a process that can be prone to errors or bias. The development of an AI tool that could update policies, and understand the implications of any changes, would reduce the legal burden for insurers and reserve billable time for legal services to the most complex of cases.

SmartPolicy, led by Kennedys Law LLP with partners Leap Beyond, are working toward the development of an AI solution that has the capacity to add clauses to existing policies without breaking the consistency of the contract. Eliminating the risk of bias and error that exists in the current process reduces the risk for insurers and the time devoted by legal services firms. The team is also testing whether the same tool can be used to examine the nuances of complex claims brought by policy holders. Situations brought about by unique and unforeseen circumstances, not mentioned in the original policy can often be a long and laborious process for the insurer and the policy holder. Utilising AI to assist and check a claim against a policy holder's policy, reduces the wait for a result, but also remove the inherent risk of human error or bias in any decision making.

The lead company, Kennedys Law LLP, made an ambitious move to adopting technology more widely around three years ago. Since then, the company has been developing their own internal technology development teams, with over 40 people on staff in 2 UK based and 2 international groupings. The innovation team has the buy in at the highest levels, but within large companies there is not always uniform support within all branches and levels. Through the success of this programme, alongside two other Innovate UK grants, the team has been able to educate the internal staff about what the firm is doing and why this benefits the firm and their own work in the future. This has created more widespread support within the company about investing in internal IP and digital technologies as there is a clearer understanding of where it fits within the other work that is being done at the firm.

The activities and outputs of the **Research Projects** have also had an impact on their participants' awareness and understanding of AI and helped to influence the training of practitioners and researchers. For example:

Building on their TECHNGI collaboration, Loughborough University and their TECHNGI partner Willis Towers Watson (WTW), has established the Mini-Centre for Doctoral Training in Industry and Commercial Property Insurance. The Centre will run until September 2026 and support PhD students to carry out research on the adoption of digital technologies (including AI) within these insurance subsectors

The AI in English Law project contributed to the establishment of a new interdisciplinary Masters-level course for law and computing science at the University of Oxford, pilot modules of which have been delivered to over 750 professional employees within government, public organisations and private firms

NextGenPSF's has helped shape organisational plans and conceptualisation of their plans for the adoption of AI&Data in future through their design sprint activities and the publications of the toolkit Collaborative AI Readiness: Design Toolkit for Professional Services Firm

In the words of one academic participant, the project "*Just got us thinking a bit about insurance and new technologies.*" Of the ten businesses that responded to the survey of research project participants, three had developed new skills and capabilities and two had developed new training and learning programme schemes. In addition, two respondents reported increased adoption of AI within their organisation. In addition, all four survey respondents from academia reported new skills and capabilities for them or their research groups.

Overall, the majority of participants reported that their participation and engagement with the research projects had supported increased understanding and awareness of the breadth of challenges and opportunities relating to AI&Data, and the sectors in scope (see Figure 14 below). In addition, the majority of participants reported their participation had led to a rethink of the skills needed in their organisation going forward (85%), and increased the likelihood their organisation will undertake a project to develop or implement AI&Data solutions (67%) (base:20).

Figure 14 Research Projects: improved knowledge and understanding for participants
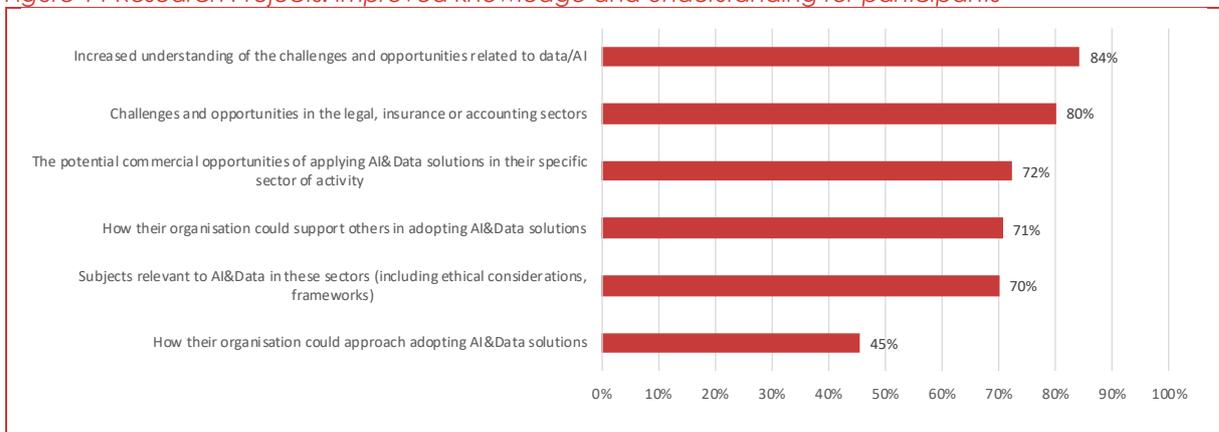
Source: Research Project Participant Survey, 2022, benefits to some extent or to a large extent, base: 13-20 businesses, academics and network organisations

The quotes presented below provide examples of how the research projects have provided insights for their participants.

"A really valuable insight into the challenges facing the professional services and law firms in implementing AI which has helped us to shape our approach to services development." AI Technology Firm

"Examples of practical applications of AI given, and a hugely useful context to the development of AI cross-sector. Valuable gathering of external data giving rise to some interesting conclusions not only in respect of use of AI, but also in terms of structural organisational models." Law firm / legal services

"Provided the university with the understanding of the needs of the sector, the strengths and limitations of the ability of law firms to take on new approaches to business and opened the eyes of our institution to the opportunities available in assisting companies in the sector take on these new technologies" Academic partner

Box 9 Research Projects: Summaries of innovation impacts

Technology Driven Change and Next Generation Insurance Value Chains (TECHNGI)

The TECHNGI project explored AI technology and insurance landscapes to identify current and future applications of this new technology, to model and understand the nature of business transformation in terms of business model process change and innovation, and transformation of the overall insurance value chain. Led by the University of Loughborough, the project brought together a multidisciplinary team of researchers who were supported by industry partners from across the insurance value chain.

The project produced a series of industry case studies that presented best practice and facilitating/challenging factors to the implementation/adoption of AI and other data technologies. The research was based on close engagement with industry partners and co-production grounding research results in the existing and foreseen challenges businesses in the sector face to deploy AI in insurance. This engagement included practitioners from within these organisations working in a range of business functions (strategic roles, specific business areas across product lines and operational processes, risk analytics, technology). In doing so, the project produced research outputs relevant to their target user groups with practicable options.

In addition to industry partners, the research team supported policy development during the project, being involved in three separate guideline committees – twice working with the European Insurance and Occupational Pension Authority (EIOPA) in support of the policy development on ethical and transparent us of AI and responding to the European Commission's call for consultation on AI. The project has also received attention from UK regulators, including the Bank of England and the Finance Conduct Authority (FCA). There are plans to produce two high level reports based on the project findings – one would target managers and the insurance industry but the other would provide insights for governments.

The benefits of this project are expected to reach insurance firms considering AI adoption with the project team believing that the resources they have created can help companies in the industry make more informed decisions. Dissemination activities continue with the expectation that the impacts on the insurance sector will become more evident following continued targeted dissemination.

The project has also led to the establishment of the Mini-Centre for Doctoral Training in Industry and Commercial Property Insurance at the University of Loughborough co-funded by the Willis-Tower Watson Research Network, a key example of how TECHNGI has led to increased industry investment and collaboration with academia in this space.

Innovating Next Generation Services through Collaborative Design (NextGenPSF)

The project examined the added value that mid-market accounting and law firms can gain from leveraging the potential for AI technologies. The research team believed that businesses operating in these sectors need to be introduced to the potential of adopting AI technologies in their business models. To achieve this, NextGenPSF focused on the development of a collaborative design model that considered current and future pathways for AI technologies and the broader, dynamic institutional landscape.

Through research conducted during the project, NextGenPSF has delivered several tools designed to support accounting and law businesses in the transition towards AI technologies. Design Sprints were interactive, short-term engagements with businesses (through interviews and workshops) to explore the potential for AI implementation and enable companies to be active co-researchers in developing strategies for AI adoption. Furthermore, in addition to the core project looking at the AI readiness of mid-market legal and accountancy firms a series of related scoping projects were conducted to explore different aspects of AI, digital and technology in the professions. The insights from the design sprints, engagement with businesses in the sector and other research results contributed to the development of two toolkits for businesses.

The first of these was the Business Model Innovation & AI readiness Toolkit (BMI) to help business understand how to integrate AI – enhance and automate different aspects of service delivery. The second toolkit was the Collaborative AI Readiness: Design Toolkit for Professional Services Firms. The toolkit offers a methodology based on design thinking and scenario planning allowing businesses to evaluate the use of AI in their operations. By using the toolkit businesses are expected to gain a better understanding of the AI landscape, areas where AI could be introduced, the likely changes and added value of using AI. A further 16 multi-firm design sprints were produced in support of the second toolkit. These design sprints offer exercises for businesses that challenge their perception

and offer the opportunity to explore AI adoption. To support continued dissemination of the work a series of webinars was launched that focused on sharing the learnings of the project.

It is expected that the tools created during the project will offer benefits to and important sector in the UK, indicating how AI technologies can maker business models more resilient to changing environments and foreign competition. However, the research team also noted that these benefits will likely become visible long after the project end. To strengthen these impacts, the project has produced a White Paper with recommendations for policymakers, regulators and sector bodies about interventions, systemic changes and forms of support that would enhance the uptake and use of AI technologies in PSFs, particularly for the delivery of high value services. By engaging with policy makers, the research team expected to help bridge the gap between the needs of the private and public sector in the deployment of AI in law, ultimately further facilitating adoption AI technologies.

Unlocking the Potential of AI for English Law

The project aimed to explore the potential and limitations of using AI in support of legal services. In collaboration with industry partners, the multidisciplinary team from the University of Oxford investigated emerging business models for deploying AI. The research involved analysis of how AI could be applied in the provision of legal services, with a focus on businesses operating in the sector. The approach looked at the constrains of AI adoption in the sector and opportunities for AI. Through this analysis overlaps would emerge presenting the overall landscape of AI in legal services. The analysis involved not only UK-based businesses but also drew on international comparisons between the UK and competitor countries (USA, Hong Kong, Singapore).

The research results indicated the changing landscape of legal service sector due to shifting skill demands connected to growing need for IT competences. The analysis also revealed that businesses in legal services tended to face challenges coordinating interdisciplinary teams which typically functioned better in a corporate environment rather than in legal services. This demonstrated both a demand for new entrants to the labour market to possess both interdisciplinary skills and capacity to work in an interdisciplinary environment, while existing employees would benefit from training opportunities on working in interdisciplinary environment.

To address these emerging needs the project team were involved in the creation of different learning pathways. One was the launch of the Masters degree course "Law and Computer Science" made jointly available to law and computer science students to foster interdisciplinarity and foster skills required to work in an interdisciplinary team environment. The experience developing the master's course was further applied in the production of training material for businesses in the form of online courses. The courses went through an iterative process with collected feedback used to adjust content, delivery for the following iteration. Business response has been positive, particularly the introduction to computer science which allowed law professionals to develop a background regarding use of emerging IT technologies.

The project helped demonstrate the education and training needs within the law sector, not only related to preparing graduates to enter the labour market with new skills but also developing skills of existing labour force. Particularly, it highlighted the need for training across all levels of organisations. This led to a consideration that future relationships between universities may need to shift towards lifelong education for continued skill renewal within the law sector. Furthermore, as a result of the project, new job openings were created within the faculty to facilitate continued research and education in the use of AI in legal services.

Full case studies of research projects available in Appendix B

The NGS programme also expects to contribute towards the development and implementation of ethical approaches to delivering services. This includes minimising bias with algorithms, increasing consumer privacy as well as improving equitable access to professional services. Some examples of this are presented in the box below.

Box 10 Select examples of ethical approaches to delivering services supported by ISCF NGS

The Floow Ltd led a small CR&D project UPLIFT – Utilising Processing to exPLore Insurance Fairness using Telematics. The purpose of the project was to strengthen the use of advance data solutions to develop a new understanding of risk for the motor industry that uses driving telemetry rather than traditional insurance proxies. This means drivers' insurance policies are based on their actual driving rather than proxies. As a result of their project, Floow have enhanced many of their core capabilities including crash detection, risk estimation, driver education and GPS data quality as well as overall improvements to their methodologies. Floow Ltd have incorporated the learnings from this project within their product solutions (specifically FloowClaims and their Data Quality Assessment Service). As a result of their NGS project, Floow have seen improved and made fairer their estimations of risk and

fraud and enhanced driver feedback. In turn, this has and will continue to enable better identification and reduction of bias, increase transparency and feedback for their customers (holders of motor insurance), and ethical handling of data.[62] The ISCF NGS project helped The Floow Limited to raise interest from health insurers towards investigations in elderly drivers. This interest led to a new project, where the company will work with clinicians to understand the relationship between cognitive decline and driving. The company has also developed strong regulatory relationships with DfT in relation to a project concerning driver behaviour change. This relationship has resulted in a COVID-19 related appointment to the House of Parliament expert group, via the Parliamentary Office for Science and Technology. They have also formed new advisory connections with the Financial Conduct Authority and have been invited into the TechNation insureTech board and working groups.

The **TECHNGI** research project worked with the European Insurance and Occupational Pensions Authority (EOIPA) to develop an ethical framework for the European Insurance market. This worked to evaluate the complex tools being deployed by AI and sought to define ethical terms under which they could be used. [63]

Etic Lab, a research and design company, led the NGS project Affordable Legal Advice focussed on finding a technical solution to help people navigate the legal aid system. Working directly with charities, the project looking to map how technology could provide solutions that reflects the needs and challenges of the organisations providing legal aid, primarily charities. The resulting report Digital Technologies in the Access to Justice Sector helps providers of legal advice be more aware of each other, ultimately improving access to support.

Data-sharing between charities is essential to supporting better coordination when it comes to providing legal aid, however confidentiality is a key concern. As a result of the project, Etic Lab also spun-out a company **Kuva**, to provide a secure integrated communication suite for the charity / advice sector which is privacy preserving (i.e., data is not collected or monetised).[64] All data shared through the platform is protected from any possible online surveillance and Kuva does no collecting, storing, or monetising of client data in any way. Kuva enables practitioners to collaborate and coordinate more effectively whilst protecting client confidentiality, collate aggregate data thereby supporting better decision making for the sector as a whole. Etic Lab's second spin out company **Network Praxis** shows how AI can help to navigate the legal advice sector without centralised data collection or resources, instead using online agents to seek out sources of advice and AI to identify the resources of relevance.

As part of the **KnowRisk** project, the consortium worked with the **Digital Catapult** and others to develop an ethics framework and roadmap and produced a report on Ethics Tools, as well as the project's own ethics report. [65] As a result of this project, the **Digital Catapult** revised their own ethics framework to be more robust and account for changes to the technological landscape.

LegalBeagles, an online legal support community relies upon volunteers to provide free legal to support, however the increasing volume of requests for support encouraged the community to, with support from the ISCF NGS programme, develop an AI chat bot to help answer up to 50% of consumer questions. The bot is able to handle many of the more common and straight forward legal questions, allowing the human volunteers to focus their support on more complex issues. The bot was able to provide enough information for 90% of cases, without requiring further input from a volunteer. This increases the number of people the community is able to support, and makes better use of their volunteers' time and expertise.

Recap implemented a privacy preserving approach that doesn't use or monetise client data.[66] While most companies use data collected from users as a profit-making component of their businesses, Recap has decided to protect user data, going so far as to ensure they do not have access to the data. This ensures that clients of Recap are secure in using the service, and can invest in cryptocurrency without the fear of hacking, or their data being sold to third parties.

Intelligent Voice found, through their NGS project, that their solution reduced the rate of false positives when it comes to identifying potential fraud cases. This facilitates the reduction of bias and discrimination from call

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62 https://issuu.com/thefloow/docs/driven_issue_6

63 https://www.eiopa.europa.eu/sites/default/files/publications/reports/eiopa-ai-governance-principles-june-2021.pdf

64 https://kuva.org.uk/

65 https://knowriskconsortium.com/wp-content/uploads/2021/07/KnowRisk-Ethics-Tools-Report.pdf and https://knowriskconsortium.com/wp-content/uploads/2021/07/KnowRisk-Ethics-Workstream-Report.pdf

66 https://recap.io/security

handlers. Since all fraud cases need to be affirmed by a human, there is often individual biases that find their way into decision making processes. Using the Intelligent Voice solution, much of the initial stages of fraud identification are undertaken by AI, which has been trained to ensure that it is unbiased in its identification processes.

See full case studies of KnowRisk, Intelligent Voice and TECHNGI in Appendix B.

Table 13 below provides a summary of all the baseline and post-exit indicators on skills, capabilities and attitudes towards AI.

Table 13 Summary of the baseline and post-exit indicators – Skills, capabilities & attitudes towards AI

Indicator [T=treatment (participants) / C = control unsuccessful applicants] [1 Interd. Research / 2 CR&D / 3 Data Access / 4 AI for services / 5 International missions] [Academic / business and successful / unsuccessful]	Strand / Stakeholder	Baseline		Post-exit	
		T	C	T	C
% Of successful applicants stating that participation in the programme have led to an increase in internal capabilities (in their companies or research groups)	[2] [3] [all, successful]	0*	—	91%	--
% of organisations stating that they have implemented or embedded learning emerging from the programme into their internal decisions	[2] [3] [business, successful]	0*	—	67%	—
% of organisations stating that they are using methods / tools emerging from the programme for their service offering	[2] [3] [business (end-user), successful]	0*	—	64%	—
% of successful applicants stating that participation in the programme has led to a better understanding of the challenges, issues and potentials of AI/data in the different sectors	[business (AI&Data), successful]	0*	—	90%	—
% of successful applicants stating that participation in the programme led to better understanding of the potential for applying AI solutions in the service sectors	[2] [3] [business, all, successful]	0*	—	100 %	—
% of successful applicants stating that participation in the programme has led to better understanding of the skills that will be needed in their organisation going forward	[2] [3] [[leads, all, successful] business, all, successful]	0*	—	75%	—

Note: 0* (assumes 0 as the baseline position)

4.5   Innovations and new economic activity

4.5.1   *New and improved products, services and processes*

The programme supported the development of **products and services**, and the adoption of new processes.

According to their PCFs completed at the end of projects, 58% of participants were primarily expecting to produce a new product and 17% expected a new service, the majority of which were new to market. 20% of participants expected to improve an existing process, service or product and 4% a new process or organisational method (base=52). In the same survey, 91% of project leads reported they had achieved their project objectives –three respondents who

had only partially achieved their objectives attributed this either to COVID, or indicated their objectives were to commercialise following the project (and therefore after submitting their PCFs) (base=37).

The survey, which explicitly asked respondents whether participation in the programme has helped them to make progress in this area, shows that:

- 84% of participants (26 out of 31 respondents) have developed new or improved products / services, and a further 10% of participants expect this to happen in the future. So far, participation in the programme has helped these organisations to develop a total of 31 new or improved products / services.

- 62% of end-user participants (8 out of 13 respondents) state that participation has led to new or improved internal processes, and a further 15% expect this to happen in the future. So far, participation in the programme has helped end-user organisations to develop a total of 32 new or improved internal processes. 64% of participants said AI solutions are currently being implemented as a part of their business models (to a large or to some extent).

The project completion forms also demonstrate that the projects made very good progress in terms of their Technology Readiness Levels (TRL). All projects progressed the TRL of their project by at-least one level, with participant progressing by a median of three TRLs and average of four TRLs. The figure below illustrates the overall shift in TRL of projects from around TRLs 1 and 2, towards high TRLs. At the end of these projects, a fifth had reached TRL 9 (commercialisation).

Figure 15 TRL progression of completed project
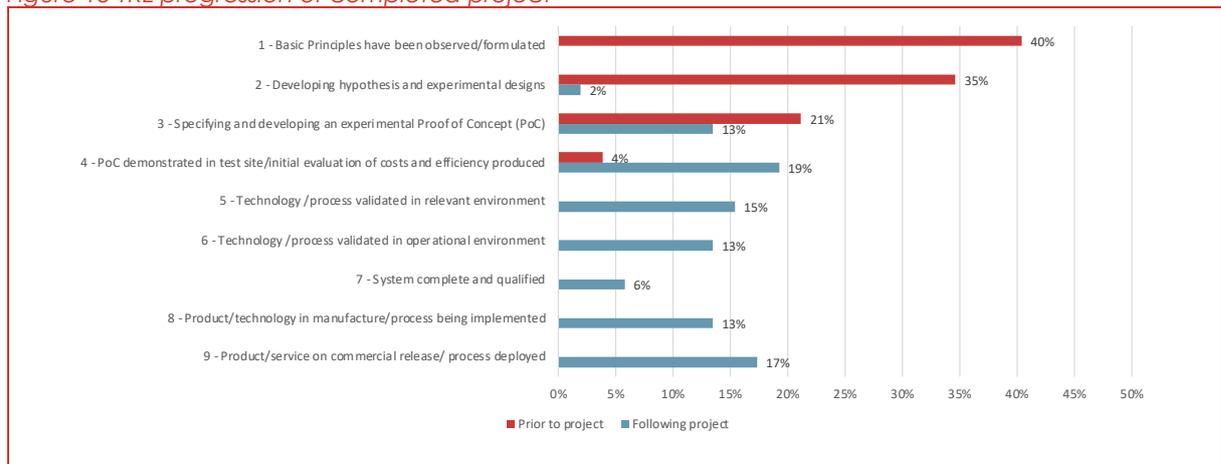
Source: NGS Project Completion Form, base: 52

Responses to the telephone survey suggests that the share of participants who offer products/services that rely on the use of AI/data analytics solutions increased from 64% prior to the programme to 84%. In contrast, the share of unsuccessful applicants with such products/services decreased to 81% from 88% prior to the programme.

4.5.2 Implementation and adoption of AI

The new products, services and processes developed and improved throughout the programme are expected to be implemented and commercialised through a range of different means.

At the end of their projects, the majority of participants expected to provide services to other businesses (73%), whilst half participants expected to enter into licensing agreements with other organisations or businesses and / or provide services directly to customers (PCFs, base=51).

Programme participants reported increased **adoption** of these technologies with an increase in the proportion of their current products and services that made use of AI solutions (from, on average, 31% to 43%). Unsuccessful applicants also reported an average increase, from 45% prior to application to 49% of current product/service offer rely on the use of data/AI analytical solutions.

New and modified business models are expected to emerge from AI & Data technology providers as well as businesses in the three services sectors. Prior to the programme unsuccessful applicants were more likely to have trialled/tested new business model (86%) than programme participants (57%). However, as a result of the programme, we see that 79% of programme participants have tested/trialled a new business model since applying to the programme compared to 71% of unsuccessful applicants.

The programme has also prompted the formation of **new spin outs or start-ups**. At the end of their projects, 24% of business participants reported in their PCFs that they expected to commercialise their developments by creating a new commercial entity (base: 51).

According to final stage survey, the programme has contributed to the creation of 6 new spin outs or start-ups[67] (listed in Table 17, Appendix A). These new spin outs or start-ups have emerged from 5 end-user companies (one R&D firm with two new spin outs). 4 more organisations stated that they expect to create a new spin out or start-up in the future. At the interim evaluation, these start-ups were estimated to have an estimated total value of ~£9.4m. None of the six spin out companies reported by participants are listed on Pitchbook as of July 2022, therefore it is not yet possible to capture the value of equity investment raised by these companies.

4.5.3   Firm expansion

The adoption and commercialisation of these products and services, and subsequent changes to organisational structures and processes will then enable firm expansion, including increases in employment, and turnover.

The NGS programme also supported **employment** within participating firms. On average, at the close of their NGS projects, participants in the R&D projects reported in their PCFs they had retained an average of 3 FTE and created a further 1.5 FTE (median, base: 51) due to their projects. Looking forward, these firms expected to have created a total of 3 FTE in three years' time and 5 FTE in five years' time (median, base: 51) due to their NGS projects.

For participants, the median number of employees has increased to 19 from 10 prior to the programme (base: 31). Unsuccessful applicants also saw an increase but to a lesser extent, increasing from 12 to 14 (median, base:98). This data comes from FAME, a comprehensive database with detailed information largely sourced from Companies House. Of note, the average number of employees has increased to 242 from 179 prior to the programme whilst unsuccessful applicants saw a decrease to 440 employees (on average), down from 676 prior to the programme.

Figure 16 Distribution of employment

Baseline	Post-exit

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[67] When asked to indicate the current value of spin outs, only one respondent provided a value of £500k and the rest said 'don't know'.
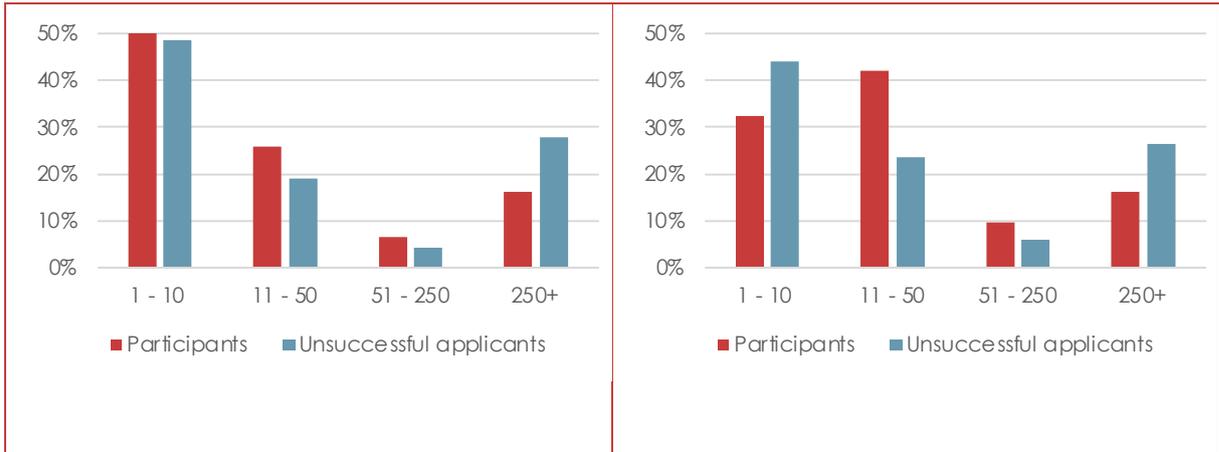
Just over half organisations agreed that their NGS project had greatly increased their **commercial opportunities** (58%). Over half of the organisations with submitted project completion forms agreed that the project had protected their current **market position**, with a further 44% expecting it to do so in the future (see figure below). The majority of organisations expect that their NGS project will allow them to expand their market position in the UK (73%).

Participants also expected their involvement in the CR&D projects to have a positive impact on **exports**. According to their PCFs, only a third of participants were exporting prior to their NGS project but 70% reported their project had increased the likelihood of exporting goods or services (base: 52), and 83% reporting they expected to expand their market position outside of the UK.

Figure 17 Impact of projects on organisations' market position
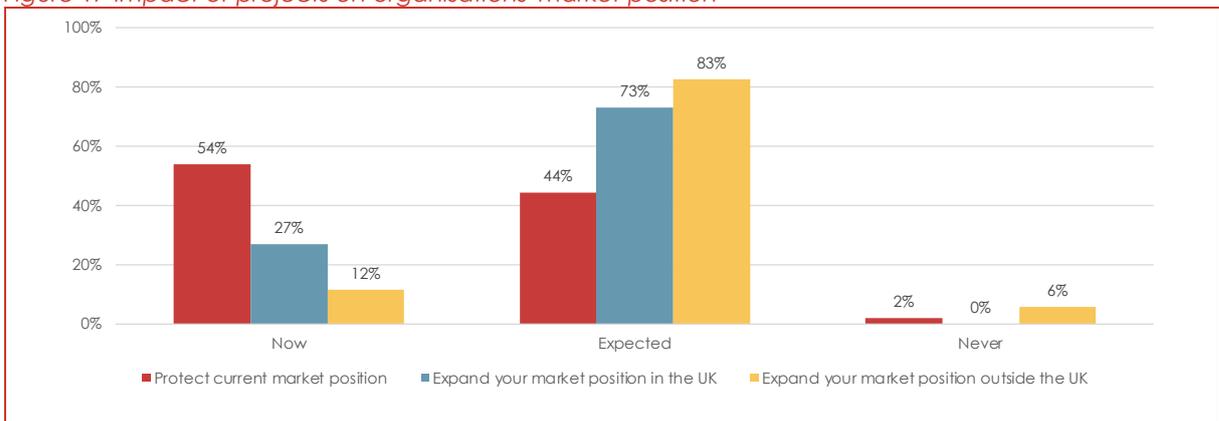
The average value of **annual turnover** has increased overall for participants (£116m, up from £69m in the baseline year of 2018) (base:7), with a median increase of £97m to £130m. The average value for unsuccessful applicants has also increased to £669m from £654m in the baseline year (base:27). It is important to note that FAME is biased towards larger firms which limits our ability to match and retrieve data for small programme beneficiaries. For this reason, the data presented here may not capture the new value created by smaller start-ups supported by the programme.

Figure 18 presents the distribution of annual turnover to illustrate the large differences between the companies in our sample.

Figure 18 Distribution of annual turnover
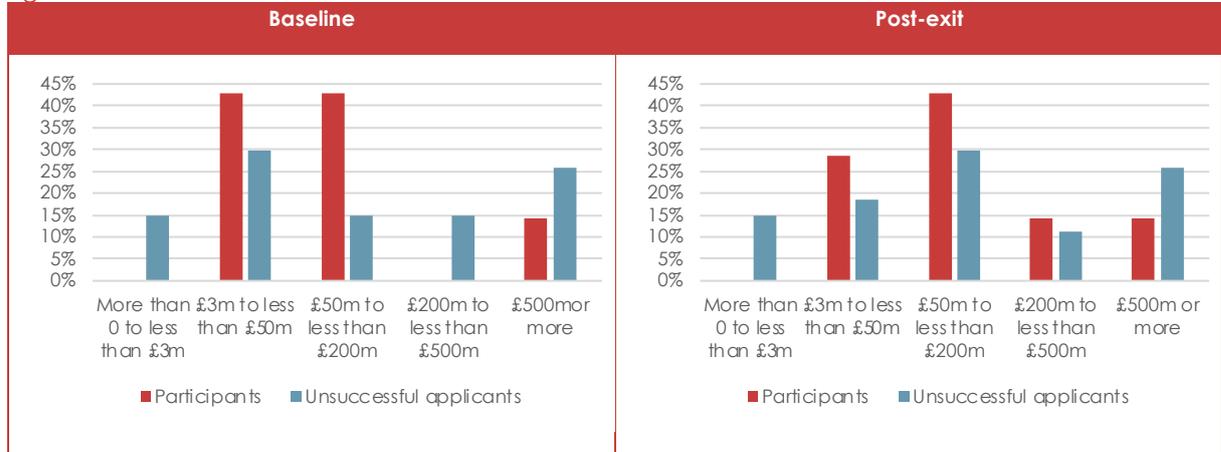
PCF information shows that companies estimated that the benefits from new products, services, or process supported by the NGS programme will lead to an annual combined turnover of £84m (~£1.9m average benefit and ~£450k median benefit per company)[68] and that this positive effect will last 6 years on average. Note that annual turnover includes income from sales revenue, license agreements and cost reductions. The total commercial benefits expected to accrue over time is £719m in total across the 44 companies who have provided subjective views on the future commercial potential of their innovations (£13m average benefit and £2.4m median benefit per company).

Note that PCF information relies on self-reporting from companies, and some values maybe overestimated[69]. However, we do expect them to reflect the overall scale of turnover benefits and direction of travel. This is mainly because our evidence shows that the programme has led to improvement on lead indicators such as development of new products and services, increased employment, increased R&D investment and private investment. According to the literature, those indicators are good predicators of improved turnover in the future.

Participants in the **Global Business Innovation Programme** (GBIP) Singapore mission in 2019 also felt the mission would have significant commercial benefits for their organisation in the 24 months following the mission (base:14). The majority of participants felt it would improve their ability to enter a new market (92%), gain valuable market intelligence (92%) and appointing a

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[68] The estimates exclude one large outlier with a reported annual average value of £54.5m which is expected to last for 3 years.

[69] Econometric analysis of Innovate UK's AI grants (2005 to 2020) showed that such grants led to significant employment impacts for both lead organisations and collaborators, but that effects on turnover were not statistically significant. Instead, positive effects on turnover began to arise around give years after the grants were awarded, reflecting the time required for such projects to reach commercialisation and translate to revenue benefits.

new collaborative partner (92%). Participants also expected to see improvements in their sales or increased revenue (72%) and the improvement and quality of their product or service (64%).

Indeed, as a result of their participation in the GBIP trade mission to Singapore, StructureFlow Ltd led to the incorporation of a subsidiary in Singapore. This subsidiary will focus on growing their presence in the Singapore legal market and the wider Asia/Pacific region.

Box 11 Case study summary: Recap

Case study: Improving the accounting and taxation practices surrounding the evolving digital currency landscape through *Recap – cryptocurrency accounting*

Cryptocurrency has rapidly entered the public consciousness in recent years, with offerings such as Bitcoin and Ethereum offering an exciting investment opportunity for some and a high-risk investment for others. As these new cryptocurrencies become more commonly traded, the infrastructure required to track transactions and digital wallet portfolios has not yet kept pace. Unlike traditional banking services cryptocurrency exists within its own blockchain ecosystem, where all transactions are stored diffusely within a network, so one individual does not have control over the information or data within. This can make things particularly complicated when trying to calculate gains and losses for tax purposes, as well as other account reporting requirements. As more people move toward cryptocurrency it is essential that the accounting and legal infrastructure is in place to support cryptocurrency users.

This project developed a software driven solution for cryptocurrency accounting, with two separate offerings for the UK and the US markets. The software can use AI to detect the type of trading activity taking place, and subsequently calculating the tax liability from each individual trade. Given that some people could make thousands of trades a year, calculating by hand the taxes for each transaction would be prohibitive for smaller scale users. The software is encrypted locally on everyone's computer, exposing private data and assets to as few risks as possible. Users are also able to track cryptocurrency across different accounts and track their entire portfolio through the platform.

Recap have now released a version for paid subscription on their website. After their beta launch, with a group of roughly 100 core users, they have been scaling up in the UK and the US. This is their first public revenue stream, but the same core system will be used as the foundation for other services in the future. Many countries changed their tax deadlines in 2020 because of COVID-19 which may mean that there is potential for an increase in users later in the year as filings need to be submitted. The project has initially focused on the UK and the US, but there is potential to expand into other markets if the demand is present. Given that cryptocurrency remains a relatively small industry in comparison to the international banking system, it is inevitable that changes will be brought in by governments to regulate the market in the future. Recap is well positioned with this offering in place to assist users navigate any changes and alleviate the concerns of new users if they choose to begin trading in cryptocurrency.

Table 14 over page provides a summary of the baseline and post-exit indicators on innovation and new economic activity.

Table 14 Summary of the baseline and post-exit indicators - Innovations and new economic activity

Indicator	Strand / Stakeholder	Baseline	Post-exit
[T=treatment (participants) / C = control unsuccessful applicants]			
[1 Interd. Research / 2 CR&D / 3 Data Access / 4 AI for services / 5 International missions]			
[Academic / business and successful / unsuccessful]			

		T	C	T	C
Number of organisations which indicate they have trialled/tested new business models	[2][3] [business (end-user), all]	57%	86%	79%	71%
% of applicants stating that methods and tools developed as part of the programme are currently being implemented as a part of their service offering	[2][3] [business (end-user), successful]	0*	—	64%	—
Percentage of organisations reporting new or improved products / services	[2][3] [all, successful]	0*	—	84%	—
Percentage of organisations reporting new or improved internal processes	[2][3] [business (end-user), successful]	0*	—	62%	—
Percentage of businesses that make use of AI&Data solutions	[2][3] [business, all]	64%	88%	84%	81%
Percentage of products and services that make use of AI&Data solutions (mean)	[2][3] [business, all]	31%	43%	45%	49%
% of successful applicants stating that participation in the programme has made the solutions developed more ready for further investment from the private sector	[2][3] [business, successful]	0*	—	91%	—
Number of spins out emerged from programme (as reported in final survey)	[2][3] [all, successful]	0*	—	6	—
Value of annual turnover, in £ (mean)	[2][3] [business, all]	£69m	£654m	£116m	£669m
Value of annual turnover, in £ (median)	[2][3] [business, all]	£97m	£73m	£129m	£85m
Number of employees (mean)	[2][3] [business, all]	179	676	242	441
Number of employees (median)	[2][3] [business, all]	10	12	19	14

Note: 0* (assumes 0 as the baseline position); Note: Excluding outliers defined as values 3 standard deviations away from the mean.

5   Value for Money

Value for Money assessment is challenging to apply to research and innovation programmes as most of the potential impacts of the programme have not yet been realised. Though the social cost-benefit analysis set out in the Magenta Book can capture short- and long-term impacts, it relies heavily on available data and the ability to monetise the impacts.

In this section, we explore two routes to monetising the benefits emerging from the programme: (net changes in) companies' valuation and turnover. This is naturally a partial approach, not a reflection of the full value delivered by the programme.[70] Note that some estimates capture effects from different angles, and may be overlapping, so they need to be look at individually to avoid double counting.

Whenever possible, and in line with UK government guidelines, we account for the counterfactual scenario (using unsuccessful applicants as a control group) to arrive to estimates of net impact (i.e., beyond what would have happened anyway, in the absence of the programme). This approach (which follows the logic of quasi-experimental design) also addresses the issue of attribution (i.e., to what extent the impacts can be attributed to the programme).

Note that VfM assessments can also be delivered through a qualitative comparison with comparable programmes, however the majority of the other ISCF programmes are ongoing (and therefore final evaluations are not available. Such a comparison may be possible in future; however this should take into consideration i) the relative size of the NGS programme and ii) its status as a Pioneer programme in new sectors for UKRI.

In terms of costs, the HMT Green Book indicates that VfM assessments should include in its cost calculations all the cost incurred by the system (i.e., all actors involved) in delivering the projects / programmes. With this in mind, our analysis used an indicative total cost of £33.2m, which includes £20.3m in value of grants, £1.67m in administrative costs (calculated as the difference between grants and the total value of the programme), £9.4m in matched funding and £1.83m in in-kind contributions, both from participants.

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70 Although we have monetised certain benefits this does not capture the full breadth of outcomes and impacts attributable to the programme, which have been documented in the sub-sections above. For example, the benefits of the programme in supporting the development of skills, greater knowledge, and awareness of AI in professional services, improved ethical AI approaches, policy influence, among others, are difficult (if not impossible) to monetise. Additionally, the potential economic effects of those outcomes would materialise in the future.

Table 15 Value for money assessment

Indicator	Assessment
Description / approach	
Participant companies' and spin outs valuation	
£20.4m in companies' valuation attributable to the programme	This metric alone accounts for 68% of total cost / investment (=£20.4m/£30m)
£11m in *net change* in valuation of participant companies since 2019.	
This estimate accounts for the counterfactual scenario (by deducting the change in valuation of unsuccessful applicants).	
It is based on 17 companies with information on change in valuations after a deal. Given the nature of venture capital investment, which tend to be discrete events and not generalised to the entire population, the figures are not grossed up to the entire population of participant companies. As such, this is a conservative estimate.	
Additionally, we estimate a £9.4m in valuation of spin outs emerging from the programmes. This is not measure as change in valuation since these companies did not exist before the programme. We have also assumed they would not have happened in the absence of the programme (i.e., no additional deductions have been made to account for the counterfactual scenario).	
It is based on 6 spin outs as reported by participants via survey, with information on valuation.	
Increased turnover	
£203m in companies' *net* change in turnover, attributable to the programme	Each £1m invested in the project would lead to £6m in net turnover overtime (=£203/£33.2m).
This is based on companies estimates of the turnover expected to emerge directly from the projects developed under the programme, over time[71]. This includes (sales, licence agreements, and cost reductions attributed to NGS projects).	
A regression analysis is then used to estimate how the grant value (associated to each project) relates to (i) the average value of expected annual turnover, and (ii) net present value of future expected cashflows generated from those projects[72].Note that this takes in to account the value of commercial benefits that are expected to accrue over several years.[73] The regression controls for observable differences in business characteristics	

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[71] As part of the project completion forms, participants were asked to specify the average annual financial value of new products, services and processes created specifically due to participation in the programme. A follow-up question asked for how long participants expect these impacts to last.

[72] This was explored by performing a linear regression (OLS) using the net present value of future expected cashflows generated from NGS projects. This takes in to account the value of commercial benefits that are expected to accrue over several years.

[73] To calculate the net present value of future benefits (NPVB), we multiplied to average annual financial value of expected income by the number of years these benefits are expected to last for, and then discounted by 3.5%. Future cashflows are presented in today's terms using the following formula:
$\frac{Avearge\ annual\ expected\ income\ x\ Number\ of\ years\ income\ is\ expected\ to\ last\ for}{(1+0.035)^{t}}$ where t represents the number of years benefits are expected to last for. To estimate the coefficient presented above, we ran a linear OLS regression model with the NPVB as the dependent variable and funding costs as the independent variable, whilst controlling for business characteristics.

Indicator	Assessment
Description / approach	

(e.g. age, size, location, lead vs collaborator, end-user vs technology provider). The regression results are based on a sample of 41 participants.

We find that, on average, every £1 invested by ISCF NGS is associated with £2.1 increase in expected average annual turnover attributed to NGS projects[74]. When we consider the expected duration of commercial benefits, we find that, on average, every £1 invested is associated with £18 increase in expected turnover attributed to NGS projects, over the entire assessment period[75].

The total grossed up figure is based on the total value of grants and accounts for the counterfactual based on the survey question that demonstrates 57% of successful applicants would not have gone ahead with their projects in the absence of the programme (and we assume that 43% would have gone ahead and obtained a similar result which is a conservative assumption) [i.e., £203m= £19.8m x 18 times x 57%].

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[74] Similarly, when both variables are log-transformed, we find that every 10% increase in funding is associated with 8.3% increase in the expected average annual turnover generated from NGS projects.

[75] The assessment period is company specific and can vary from 1 to 15 years, depending on how long respondents believe the expected commercial benefits will last for.

6 Conclusions

There is a growing opportunity and demand for AI and data driven methods within the professional services and whilst the deployment of these technologies could support transformative change, their adoption and deployment has been challenged by a range of factors. This includes the existing business models and practices in place, supporting access to sufficient quantities of quality data to support data driven methods and the knowledge and skills required to support the uptake of these technologies.

The NGS programme has helped to address these various challenges. As a £20m pioneer fund, the programme reflects the need to initially stimulate engagement from a smaller, targeted section of the high-value data-driven services sector.

This evaluation demonstrates that the programme has achieved or made substantial progress across all the main expected outcomes and impacts, as identified in the Theory of Change:

* Engagement, partnerships and collaborations
* Investment, funding and leverage
* New knowledge production and dissemination
* Skills, capabilities and attitudes towards AI
* Innovations and new economic activity

The relatively small investment in the programme, especially relative to the size of the three service sectors in scope, has meant that results have mostly materialised at the level of those organisations directly participating in the programme. Additionally, the programme has supported the formation of a wider cohort of organisations within the end-user sectors working with and / or to deliver solutions to professional service companies.

These effects in addition to the other areas of impact listed above (and further described below) are expected to a have catalytic effect in the future.

The programme has supported a range of collaborations and partnerships, and laid the foundation for further engagement

The application process and community building activities funded by the programme have fostered new collaborations. After engaging with the programme (at the proposal stage), both successful and unsuccessful applicants to the CR&D strands reported having established **new partnerships with customers and end-users**. Moreover, almost half of unsuccessful applicants stated that **the programme had been one of the main catalysts** for the establishment of these new relationships, and most of programme participants stated so. There is a strong expectation that these collaborations will continue, with 75% of participants agreeing they could see avenues for future collaboration with industry/academia due to the programme. Furthermore, 25% of participants and 23% of unsuccessful applicants indicate that these new partnerships and collaborations have resulted in access to further funding (beyond the ISCF NGS grant) to support their activities. At the close of their projects, 89% of participants reported they had developed or improved their collaboration and partnering skills due to the programme.

The Research Projects have also supported a range of collaboration and partnerships, reporting 39 formal collaborations and partnerships through their ResearchFish submissions, most of which are with private organisations and has leveraged a total of £1.83m of cash and in-kind contributions. The true number of organisations engaged by the research projects is likely to be higher as a result of their engagement and dissemination activities and the survey

of a sample of these organisations indicates that the majority did not apply for the NGS programme, indicating the research projects are extending the reach of the programme beyond its core beneficiaries. These partnerships and collaborations have provided a platform for new and stronger connections between industry and academia.

Additionally, the Global Business Innovation Programme (GBIP) Singapore mission in 2019 was beneficial for participants to gain new contacts, with each company securing an average of 35 meetings. These new contacts were valuable for increasing their understanding of the market in Singapore, and companies reported that around half of the meetings generated at least some interest and potential for future collaboration.

Finally, since its launch in May 2019, the AI for Services network has delivered 34 events to over 2,452 attendees, both in-person and online. Around half attendees reported securing new contacts or collaborations, either commercial leads or new partners for collaborative research as a result of attending these events.

The programme has supported the production of new knowledge relating to the development and adoption of AI&Data for the professional services.

Academic researchers involved in the programme have produced a total of **101 academic publications**. 21 of these publications have come from research groups involved in the CR&D projects, and 87 publications emerging from the Research Projects, including journal articles, books and book chapters, policy briefings and consultancy reports. Programme participants have also been increasingly active in publishing **think pieces (including blogs)**, which are good platforms to engage with and disseminate insights and knowledge to a wider audience beyond academia. Programme participants report an average of 9.7 think pieces, up from 6.6 in a typical year prior to applying. For unsuccessful applicants, the number of think pieces published has decreased from 7.4 prior to the programme to 5.5 in the last year.

Research Projects have been actively disseminating the knowledge and insights gained and delivered 199 engagement activities, many of which include delivering presentations and webinars in collaboration with the AI for Services network. This demonstrates the added value of the AI for Services network in providing a valuable platform for disseminating learnings emerging from the programme.

The programme has supported increased development and adoption of AI/Data solutions

The majority of CR&D participants had achieved their project objectives at project close. The programme has actively supported the development of **new products and solutions**, with 84% of participants reporting a new or improved product or service, and further 10% of participants expect this to happen in the future. On average, the NGS CR&D projects progressed their project by 3 TRLs (median) at project close, with all projects progressing by at least one TRL. Participants were also significantly more likely to have trialled or tested new business models participating in the NGS programme.

The programme is also supporting **increased adoption** of these technologies. 62% of end-user participants (8 out of 13 respondents) state that participation has led to new or improved internal processes, and further 10% expect this to happen in the future. Following the programme, the proportion of participants who offer products/services that rely on the use of AI/data analytics solutions increased from 64% to 84%.

Members of the AI for Services network also reported their engagement has increased the likelihood they would pursue a project to develop AI & data related technologies in the future.

The programme has supported improved R&D capability and capacity for businesses

The programme has supported capacity building, both within the direct beneficiary organisations and supporting increased engagement with the wider sectors through the AI for Services network and the Research Projects.

Programme participants are producing more **IP and exploitable trade secrets** since joining the programme, reporting an average increase from 1.0 to 2.2 (base:25), whilst unsuccessful applicants reported an average decrease from 1.6 at the point of applying to 0.8 in the past year (base:30).

Our evidence shows that participating companies were active in R&D in the area of AI and data applications prior to participation, but to a small scale. Prior to the programme, a fifth of participants were not investing in AI/data R&D, and only a third were investing more than £100k. Following the programme, just over half were investing more than £100k. On average, this was an increase from £99k at the baseline to £628k following the programme. This is substantially higher than the unsuccessful applications (£86k to £183k).

Of note however, the levels of R&D investment in general for both participants and unsuccessful applicants has increased. On average, programme participants reported an R&D expenditure of £1.2m, a significant increase since the baseline position of £172k. Unsuccessful applicants also experienced and increase in R&D expenditure from £240k prior to the programme to ~1.5m in 2021/2022. This indicates that whilst the service sectors are becoming more innovative in general, the NGS participants have a stronger focus on AI/data. Though we see increased investment in AI&Data R&D across the sector, a significantly higher share of participants reported an increase in the value of this R&D expenditure compared to unsuccessful applicants (77% vs 50%).

Almost all participants also agreed that their involvement in the programme has made the solutions developed readier for further investment from the private sector. Participation in the programme has then led to further investments, beyond grant commitments, which signal confidence in the perceived potential of those ideas and projects. Indeed, participating businesses have invested, on average, ~£546k in their projects and ideas 'post grant' (mostly from internal resources but also from other private investments and access to further public funding outside of ISCF NGS). If this were to hold across the 52 unique participating businesses in the ISCF NGS programme, then the total cumulative investment would equate to around £28m.

In contrast, 53% of unsuccessful applicants did not carry on with their ideas/projects, and those who did invested less, on average (£334k). There are various possible reasons for this decreased investment: the proposed project proved not to be viable; securing funding was critical to the progression of the project and no other sources of funding were secured; or that unsuccessful companies subsequently re-directed their attention to other areas of the business. These results provide an indication of the net benefit (additionality) of the programme.

The programme has supported the development of new skills and capabilities, and has had an impact on training and capacity beyond participants

Almost all participants in the CR&D projects reported increased understanding of sector challenges and opportunities (89%), of the challenges and opportunities relating to AI&Data (97%) and of the potential for applying AI solutions in their sectors of activity (94%). In addition, all participants reported developing new or improving their technical skills through their NGS project, with significant contributions to other organisational skills including problem solving, project management, strategic thinking and business planning.

We have also seen positive impacts to the knowledge and skills base within the wider pool of organisations engaged within the AI for Services network and the research projects, who reported increased understanding and awareness of the breadth of challenges and opportunities relating to AI&Data, and the sectors in scope. In addition, these organisations also reported that their involvement had led to a rethink of the skills needed in their organisation going forward, and to a lesser extent increased the likelihood their organisation will undertake a project to develop or implement AI&Data solutions.

The programme has also supported influenced and contributed to the development and production of wider training resources, including the development of new Masters degree course and a new mini-centre for doctoral training, as well as training materials and guidance tools to facilitate organisational change.

The programme has resulted in commercial benefits for participants

Even at the end of their NGS projects, just over half organisations agreed that their NGS project had greatly increased their **commercial opportunities** (58%), with the majority indicating their project had already protected their current market position or was expected to do so in the future. Just under a third had expanded their position, with the remainder expecting to do so in future.

The NGS projects have also supported increased employment within participating firms. Participants in the R&D projects reported in their PCFs they had retained an average of 3 FTE and created a further 1.5 FTE (median). Participant median annual turnover has also increased, from £69m at the baseline to £116m (base:7). The median value for unsuccessful applicants has also increased to £669m from £654m in the baseline year (base:27).

Six different **spin outs and start-ups** have already materialised, with an estimated total value of ~£9.4m (as of 2021).

The programme has also enabled participants to secure **external investment** deals. Despite a fall in the number of investment deals for both participants and unsuccessful applicants due to the COVID-19 pandemic and retrenchment of the investment community, the total number of deals has remained consistent. The median **value of external equity investments** has increased for both participants (from £250k to £1m) and unsuccessful applicants (£500k to £780k). A fifth of participants reported developing new fund-raising skills through their NGS project. In addition, half of participating businesses are registered on the Pitchbook database compared to only 15% of the 185 unsuccessful applicants, in itself a positive signal of the strength of the companies.

According to their PCFs, only a third of participants were exporting prior to their NGS project but 70% reported their project had increased the likelihood of exporting goods or services (base: 52).

Eight participants (36%) have entered into an agreement to license out their intellectual property / trade secret, up from 3 organisations (14%) prior to programme. In comparison, 4 unsuccessful applicants (25%) have secured license agreements, down from 6 organisations (38%) prior to the programme. Based on information provided by four participants (out of the eight with licence agreements), the combined value of those agreements is £4.2m, compared to £16.8m for the four unsuccessful applicants with license agreements.

The programme has also supported social impacts through development of 'ethical AI' solutions and contributions to policy

Though not one of the core objectives of the programme, the ISCF NGS has made valuable contributions to development and understanding around ethical AI. This has included the development of solutions that support privacy protection and removal of bias and supported the development and adoption of ethical frameworks and guidelines, supporting consumer protection and that data is used responsibly.

The research projects have been successful in collecting and disseminating learnings and insights on the facilitators and barriers of adoption to both the UKRI programme delivery team, and to national government departments. We have also noted several instances of spillovers from the programme to the public sector. The contributions of the programme to cross-Whitehall conversations are unclear, though there are strong examples of emerging collaborations between the delivery team and government departments, as well as direct contributions from the research projects into policy development.

Beyond the results emerging from the implementation of projects, there are also positive findings with respect to the programme design and internal learning

The design of the ISCF NGS programme has supported the realisation of its objectives

As concluded in the process evaluation of the ISCF NGS programme, the **overall design of the programme** has flexibility and strong feedback loops built into the initial design of the programme, enabling a programme that has adapted and developed programme activities in light of market needs and response to initial activities. The phased development of activities has supported the development of an **overall programme which is greater than the sum of its parts**. The **programme strands are well aligned** in terms of addressing different needs and gaps in the market. Coordination and cross-pollination between the strands are in part facilitated by overlap in project participants across the CR&D strands and the Research projects. The AI for Services network has played a valuable role in connecting disparate strands of the programme, providing a platform for engaging with the wider sectors and disseminating learning emerging from the programme. Though the COVID-19 pandemic resulted in delays / extensions to many ISCF NGS projects, this has not substantially limited the impact of the projects themselves.

The NGS programme has supported internal learning for UKRI

One of the expected deliverables or the ISCF NGS programme as set out in the business case was to determine where government investment would have greatest impact on the sectors and provided evidence to guide future investments. The ISCF NGS programme has demonstrated the added value of UKRI intervention in supporting AI development and adoption in the professional services. The programme's design, and the inclusion of the research projects and network, has provided a valuable platform for UKRI to start engaging with and supporting these sectors, building understanding and relationships within UKRI to undertake future research activities. As 80% of the business participants within the NGS programme are new to Innovate UK, this engagement helps the programme to build credibility within the wider sector.

The NGS programme has also demonstrated the value of ESRC-IUK collaboration, the strength of which has been a key enabling factor to the delivery of the programme, bringing together complementary expertise. This has also demonstrated the value of including social sciences research within innovation funding programmes.

In addition, the programme has begun engaging a wider cohort of organisations and stakeholders (e.g., industry bodies, network organisations, regulators, policy makers) and involving them in conversations around these emerging technologies, fostering a pipeline of potential participants, contributors and collaborators for future investments in this area.

7 Appendices

Appendix A   Summary table of indicators

The numbering of indicators follows the indicator framework developed in Phase 1 of the study.

Table 16 Summary table of indicators

Indicator number	Indicator [T=treatment (participants) / C = control unsuccessful applicants] [1 Interd. Research / 2 CR&D / 3 Data access / 4 AI for services / 5 International missions] [Academic / business and successful / unsuccessful]	Strand / Stakeholder [1][2][3][4] [Academic] [Business X]	Baseline value		Final Evidence		Source
			T	C	T	C	
Block 1: Engagement, partnerships and collaborations Note: 0* (assumes 0 as the baseline position); ** 0.59 excluding 1 outlier; *** with academics; **** with end-users							
Output 1	Number of networking events organised	[1][2][3][4][5] [all]	0*	—			Programme data
Output 2	Number of attendees to networking events	[1][2][3][4][5] [all]	0*	—			Programme data
Output 3	% Of attendees who identified potential commercial leads due to participation in events organised by the AI for Services network	[2][3] [all]	0*	—	75%	50%	Survey with applicants
Output 4	Number of new partnerships and types of partners (mean)	[1][2][3][5] [all]	See Section 4.1				Survey with applicants
Output 6	% of organisations that indicate that they can see avenues for future collaboration with industry/academia due to the programme	[1][2][3] [all, successful]	0*	--	75%	—	Survey with applicants
Output 7	Number of projects in collaboration and type of collaborators (including, business-academia, academia-academia, and business-business) (mean)	[1][2][3] [academic, all]	13.1	4.0	1.0	0.4	Survey with applicants
Output 8	Number of projects in collaboration with academia (mean)	[1][2][3] [B]	0.5	0.4	1.0	0.4	Survey with applicants
Outcome 1	Number of new collaborations funded (outside of ISCF NGS) (mean)	[1][2][3] [all]	0*	—	0.7	0.3	Survey with applicants
Outcome 5	% Of successful applicants that state that participation in the programme have led to increased cross-sectorial learning	[1][2][3][4] [business, all, successful]	0*	—	75%		Survey with applicants
Block 2: Investment, funding and leverage Note: * average value, total raised £16.75m; ** average value, total raised £8.94m; ***average value, total raised £12.02m; ****average value, total raised £9.16m							
Output 9	Cumulative expenditure in projects (excl. grant value), in £ (mean)	[1][2][3] [business, all]	~£164k	~£592k	—	—	Survey with applicants
Output 10	Cumulative expenditure in projects (excl. grant value), beyond match funding, £ (mean)	[1][2][3] [business, all]	---	—	~£546k	~344k	Survey with applicants

Indicator number	Indicator [T=treatment (participants) / C = control unsuccessful applicants] [1 Interd. Research / 2 CR&D / 3 Data access / 4 AI for services / 5 International missions] [Academic / business and successful / unsuccessful]	Strand / Stakeholder [1][2][3][4] [Academic] [Business X]	Baseline value		Final Evidence		Source
Outcome 15	Value of R&D expenditure in AI with focus in service sector, £ (mean)	[1][2][3] [business, all, successful]	£99k	£86k	£628k	£183k	Survey with applicants
	Value of R&D expenditure in AI with focus in service sector, £ (median)	[2][3] [business, all, successful]	£63k	£68k	£275k	£50k	Survey with applicants
Outcome 16	Value of equity investment raised by applicants, £ (median)	[1][2][3] [business, all]	£250k	£500k	£1m	£780k	Pitchbook
Block 3: New knowledge production and dissemination Note: 0* (assumes 0 as the baseline position);							
Output 11	Number of think pieces (incl. blogs) published in a year	[1][2][3] [all]	6.6	7.4	9.7	5.5	Survey with applicants
Output 12	Number of reports published in a year (grey literature)	[1][2][3] [all]	4.5	1.6	9.2	4.0	Survey with applicants
Output 13	Number of publications emerging from programme participants	[1] [academics, successful]	0*	—	87	—	Researchfish
Output 18	Number of IP and/or exploitable trade secrets developed	[1][2][3] [all]	1.0	1.6	2.2	0.8	Survey with applicants
Outcome 4	Percentage of publications focused on addressing questions / challenges faced by users in the sectors in scope[76]	[1] [academics, all]	18%	68%	21%	60%	Survey with applicants (academics)
Block 4: Skills, capabilities and attitudes towards AI Note: 0* (assumes 0 as the baseline position);							
Output 19	% of successful applicants that state that participation in the programme have led to an increase in internal capabilities (in their companies or research groups)	[1][2][3] [all, successful]	0*	—	91%	--	Survey with applicants
Outcome 9	Number and % of organisations that state that they have implemented or embedded learning emerging from the programme into their internal decisions	[1][2][3] [business, successful]	0*	—	67%	—	Survey with applicants (businesses)
Outcome 10	Number and % of organisations that state that they are using methods / tools emerging from the programme for their service offering	[1][2][3] [business (end-user), successful]	0*	—	64%	—	Survey with applicants (businesses)
Outcome 12	% of successful applicants that state that participation in the programme has led to a better understanding of the challenges, issues and potentials of AI/data in the different sectors	[business (AI&Data), successful]	0*	—	90%	—	Survey with applicants (businesses, AI&Data)

[76] Successful applicant base: 6, unsuccessful applicant base: 5

Indicator number	Indicator [T=treatment (participants) / C = control unsuccessful applicants] [1 Interd. Research / 2 CR&D / 3 Data access / 4 AI for services / 5 International missions] [Academic / business and successful / unsuccessful]	Strand / Stakeholder [1][2][3][4] [Academic] [Business X]	Baseline value		Final Evidence		Source
Outcome 13	% of successful applicants that state that participation in the programme led to better understanding of the potential for applying AI solutions in the service sector	[1][2][3][4] [business, all, successful]	0*	—	100%	—	Survey with applicants (businesses)
Outcome 14	% of successful applicants that state that participation in the programme have led them to re-think the skills matrix in their business to increase AI skills	[1][2][3] [business, all, successful]	0*	—	75%		Survey with applicants (businesses: end-user)
Block 5: Innovations and new economic activity Note: 0* (assumes 0 as the baseline position); ** total value							
Output 20	Number of organisations which indicate they have trialled/tested new business models	[1][2][3] [business (end-user), all]	57%	86%	79%	71%	Survey with applicants (businesses, end-user)
Output 23	Number of organisations reporting improved products	[1][2][3] [all, successful]	0*	—	84%	—	Survey with applicants (businesses)
Output 24	Number of organisations reporting improved internal processes	[1][2][3] [business (end-user), successful]	0*	—	62%	—	Survey with applicants (businesses: end-user)
Output 26	% of current products and services that make use of AI solutions	[1][2][3] [business, all]	31%	43%	45%	49%	Survey with applicants (businesses: end-user)
Output 27	% of successful applicants that state that participation in the programme has made the solutions developed more ready for further investment from the private sector	[1][2][3] [business, successful]	0*	—	91%	—	Survey with applicants (businesses: end-user)
Outcome 17	Number of spins out emerged from programme	[1][2][3] [all, successful]	0*	—	6	—	Survey with applicants
Outcome 18	Current valuation of spin outs emerged from programme, in £	[1][2][3] [all, successful]	0*	—	£9.4m		Survey with applicants
Outcome 19	Value of equity investment raised spin outs emerged from programme	[1][2][3] [business, successful]	0*	—	*Not avail*	—	Pitchbook

Indicator number	Indicator [T=treatment (participants) / C = control unsuccessful applicants] [1 Interd. Research / 2 CR&D / 3 Data access / 4 AI for services / 5 International missions] [Academic / business and successful / unsuccessful]	Strand / Stakeholder [1][2][3][4] [Academic] [Business X]	Baseline value		Final Evidence		Source
					able 77		
Outcome 21	Value of annual turnover, in £ (median)	[1][2][3] [business, all]	£59m	£73m	£112 m	£85m	FAME

Table 17 ISCF NGS spin out companies

ISCF NGS participant	Spin out name
ALTELIUM LTD	Altelium Energy Risk Consulting
ETIC LAB LLP	Kuva (Trading name, company name is Secure Integrated Communications Suite ltd.)
ETIC LAB LLP	Network Praxis (ELNAC Ltd.)
Kennedys Law LLP	Kennedy's IQ
MOORCROFTS LLP	ContrAI ltd
University of Oxford	SEREIN AI LIMITED

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77 None of the six spin out companies reported by participants are listed on Pitchbook as of July 2022

Appendix B   Full Length Case Studies

B.1   Automation and Transparency across Financial and Legal services: Mitigating Risk, Enhancing Efficiency and Promoting Customer Retention through the Application of Voice and Emotional AI

B.1.1   The project's environment

Insurance fraud costs the UK ~£3B in 2017, and the industry spends roughly £250 million per year to tackle this crime. Around 470,000 fraudulent claims we detected in 2018, with an average scam uncovered of £12,000.[78] Current manual processes to identify illegitimate claims are repetitive, time-consuming, inefficient, non-user friendly with no consideration for vulnerable customers. This presents fraud identification as a primary target for developed AI capabilities.

Current advanced emotional AI technologies capture (non-verbal) human expressions via computer vision, voice analysis and/or biometric sensors. These lack processing speed and are unable to understand both vocalics and linguistics. No solution currently combines artificial intelligence and voice technology for a true conversation with full explainability of its decision.

This project aimed to develop an AI software that detects and interprets emotion and linguistics from voice, overcoming the limitations of current credibility assessment tools with a new approach. This will offer a breakthrough technology for the anti-fraud sector, simultaneously providing unique expertise to the UK in deep neural networks and AI with cross-sector potential.

B.1.2   Project profile

B.1.2.1   Project overview

Grant Summary
The project: Automation and Transparency across Financial and Legal services: Mitigating Risk, Enhancing Efficiency and Promoting Customer Retention through the Applications of Voice and Emotional AI
Strand: CR&D
ISCF NGS funding received: £1,361,570 (Intelligent £888,092; UEL £473,478)
Partner organisations: Intelligent Voice Limited (https://intelligentvoice.com/), University of East London, Strenuus Limited (http://strenuusltd.com/)
Status of the project: Closed (Apr 19 – Mar 21)

The project aimed to apply unique multi-disciplinary expertise in language processing, data analytics and behavioural analysis to develop a novel AI software that detects and interprets emotion and linguistics in voice. This software will have applications in credibility/vulnerability assessment, key word spotting, in-call behavioural guidance and transparency of the decision-making process. As part of the project, the software will be trialled by an insurance contact centre during live claims handling.

Ethical considerations about the use of AI in these types of services and solutions require the users of the algorithm to be able to explain its decision-making processes. To address this, Intelligent voice brought in the University of East London, which has a depth of machine-learning expertise. UEL is working on building deep learning and machine learning algorithms

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78 https://www.abi.org.uk/news/news-articles/2019/08/detected-insurance-frauds-in-2018/

that have built-in explainability features. The algorithms are built as decision support tools, and not to be used as the sole element for automatic decisions.

Intelligent Voice have an existing global client-base for their voice recognition/transcription software in the financial/insurance services market, and to support the exploitation of the technology, the project has insurance software providers are in place as in-kind contributors for exploitation. To date, Intelligent Voice has developed automatic speech recognition engine, successfully concerting audio to smart transcript audio and text aligned files with voice biometrics embedded. Strenuus has developed a linear process flow to identify 50 linguistic measures and covering all English dialects with a proof-of-concept study with Torrey Hedge Fund. This project will advance both concepts, and in collaboration deep neural networks academics at University of East London, aimed to deliver the first solution to develop a vocal AI technology for credibility/vulnerability assessment, key word spotting, in-call behavioural guidance and transparency of the decision-making process.

To achieve this, specific project objectives include:

- Further develop algorithms to understand nuances of human behaviour, context, credibility and vulnerability from speech

- Design deep neural network architecture to augment the rule-based model, learning the type of language and behaviour that lies behind fraudulent claims.

- Integrate algorithms to an existing platform to be tested in a live trial

- Refine algorithm to ensure at least 75% output accuracy

The project will advance the technology from TRL4 to TRL6 enabling the partners to design a software solution ready to be trialled in real live call environments with Insurance Contact Centres and integrated with current embedded software solutions (in-kind contributors confirmed) to support the commercial launch of a solution within 6 months of project end.

Intelligent Voice currently sell their software to providers of technology to the finance and insurance sector i.e. their products are integrated into packaged systems that bigger companies then go out and sell to the finance sectors. Intelligent voice now want to push this software out through the wider insurance-tech channel and through businesses developing call centre systems, both here in the UK and globally. This will create a significant business opportunity (forecast revenues £40.5M by 2025) for the UK and will disrupt the current anti-fraud market, setting a new standard in voice transcription with a solution that offers credibility/vulnerability assessment, GDPR compliance, improved efficiency and customer experience.

Beyond insurance, Intelligent Voice see the market for this software as a global opportunity with applications for accountancy firms, hedge funds, and legal firms through fintech software packages as well as non-professional service organisations.

B.1.2.2   The project participants

The project is led by Intelligent Voice, a London based technology SME specialising in speech to text, voice analytics and voice biometric identification. To date, Intelligent Voice has launched a speech-to-text technology that allows calls to be analysed and anomalous behaviour to be tracked. These processes are up to 400x faster than real time indexing key words and phrases allowing for the storage and search of all voice data. This exceeds other emotional AI solutions which suffer from latency of processing the spoken word.

Intelligent voice is working together with their long-term partner, Strenuus, a specialist consultancy and training provider for in identifying fraudulent behaviour and risk. Strenuus

completed Proof-of-Concept studies with their linguistic algorithms to assess credibility, successfully identifying deception,

The project team also includes two researchers at the University of East London (UEL) with demonstrable expertise in data analytics, machine learning architecture and AI explainability. Intelligent Voice and UEL had a pre-existing R&D relationship and had been collaborating for 5 years.

The project also has in-kind support (non-partners) from established insurance technology providers ICE Insure Tech, a software provider to insurance companies, and Nuance, a tech company providing speech recognition and AI technologies. These partners are supplying data to the project and contributing to setting the requirements for the solution.

The project team is also supported by PNO Consulting, an external innovation consultancy firm to support the project team in delivering the project. Their role is relatively small and is primarily focussed on providing support for meeting monitoring and reporting requirements whilst also advising on management and delivery of grant funded projects.

B.1.2.3   Project activities

Through NGS support, the project will develop behavioural analysis algorithms, explain the neural networks of the system, integrate the solution to ICE's existing platform and trial the technology in a controlled environment. So far, the academic partners have not interacted with the NGS research strand and were not aware of it.

The project is comprised of 9 work packages:

- **Define end user requirements:** Meetings with end users (insurance firms) to ascertain their requirements and meetings with established insurance technology providers to profile the full technical specifications to determine overall system requirements.

- **Develop behavioural analysis algorithms** that combine natural language processing and processing the audio signal. This development will leverage IV's existing technologies for speech to text transcription and technology to track speech in real time.

- **Data analytics:** Collecting data from the insurance industry and processing it using machine learning to uncover patterns of fraudulent behaviour, identify trends and optimise effectiveness of linguistic markers

- **Machine Learning architectures & AI Explainability:** Investigating and designing Deep Neural Network (DNN) architectures to replace the rule-based model of credibility analysis tool, including investigation into strategies to improve explainability of DNN and its decisions. This will verify predications, identify problems and provide an audit trail for the decision systems.

- **Integration of behavioural analysis algorithm development and voice transcriptions** into ICE's existing computing hardware and integration of the system.

- **Live system trials:** During the final 6 months of the project, the system will be tested by Equity Red Star in real claims handling as testing in a live environment (minimum 100,000 calls) to assess algorithm capability and refine it and the user interface. Due to the impact of COVID, this element of the project had to be delayed, and was not completed during the project. Many potential participants were unwilling to initiate 3rd party projects during the COVID-19, when so much internal projects were already under scrutiny. The live system trials will now commence at the end of June 2021.

- **User interface development:** Based on the requirements outlined by users and the feedback from the live trials, the project will develop and iterate the user interface and reporting suite to ensure it is easy to use.
- **Dissemination & innovation management:** Managing outputs of the project (e.g. patent filing) and conducting dissemination and communication activities through industry associations and bodies, trade publications and journals, partner

B.1.2.4   Project delivery

The project concluded in March 2021. The partners were busy until the end of the project recently been very busy, going from the product launch in 2020, and completing field testing with a US insurer during the fall of 2020 and into 2021. Publication of results was also put on hold as Intelligent Voice and UEL were filing a patent that was needed to protect some of the advances. This patent was filed at the writing of this case study. UEL secured 6 months of extra funding from Innovate UK, which it utilised to keep the research team together while they shifted their focus to publishing the results of the R&D elements of the project.

B.1.3   Programme effects

B.1.3.1   The role of the NGS programme

Intelligent voice has taken an enormous amount of benefit from the ISCF NGS. They would love to participate in future iterations of the programme, but also hope that others could realise similar benefits to their own. The programme has allowed them to rapidly advance their technology, with support from academic researchers, beyond what would have been possible on their own during the same period. Their success within the programme has propelled them to being considered leaders in their field of emotional speech recognition.

For the academic partners at UEL, the NGS programme was its first contact with the insurance sector. This has opened a lot of interesting applications for the technologies that they are developing in an R&D setting. The researcher at UEL considers CR&D funding to be extremely valuable for their research group and stressed the added value of working with real world data and developing products directly with industry. The academic partner also had a KTP project before this grant, which paid for one of their PhDs and was generally complimentary about the support received by Innovate UK programmes.

B.1.3.2   Effects of participation on the organisations supported

Intelligent Voice employs 30 people and expects continue growing in the near future, with 6 more hires already being considered. Expectations remain that the company will grow significantly by 2025, driven by further project work and expanding sales. The project created a successful prototype system for the final system trials, starting in June 2021 with the product coming to market and being used commercially since the end of the summer 2021. The system has been proven to match trained humans in fraud detection, and even was able to pick up on some concerns that the human fraud officers missed. The system has shown to be able to reduce the number of false negatives that are processed for further review, thereby improving the customer experience, and improves the quality of the cases that flagged as fraudulent. This means that the workers can commit more time to actual fraud cases, rather than spending time pursuing a fraud that doesn't exist. This also improves the ethical application of the service, removing potential biases that may exist in the human element.

The ISCF NGS project has resulted in the company increasing its revenues by nearly 50%. This is also expected to continue growing, as the other uses for the new services are tested and brought to market.

In addition to the core project area, there are three additional applications for this technology that the team at Intelligent Voice are pursuing:

- Sales enablement – for telesales, the ability to track progress and development beyond the quantitative data is important to the continued development of the workforce. The system has the capacity to monitor the behavioural responses from both the customer and the employee during a live encounter, hopefully improving learning opportunities for the employer. Intelligent voice is in conversations with a call centre provider in the US to begin trials in the summer of 2021

- Welfare – the types of calls that come through 999 and 111 are completely random. This means that operators never are prepared for the type of call that may come through to their phone. The ability to track the welfare of the operators can assist managers in knowing when to remove someone from the front lines, or when to offer counselling, or to only allow them to take non-emergency calls for a period. There is also the potential that the system could identify hoax calls, eliminating another point of stress for operators. A test of this is being discussed for the fall of 2021.

- Mental Health - the technology can detect changes in mood and condition. There are very limited commercial applications thus far (3-5 years). In remote medicine, speaking with an AI may be more comfortable than speaking with a remote doctor. There are certain indicators that the AI can pick up on to help identify mental health concerns that may be imperceptible to a human in conversation unless it is verbalised specifically.

On the back of this research, the team at Intelligent Voice are also working to develop a new product for medical professionals. Due to the research into text-based analysis that was used on this ISCF NGS project, the team now is able to work on extracting medical diagnoses from conversations and translate them directly into medical records. This can dramatically reduce the level of paperwork for medical professionals.

Since the project concluded, Intelligent Voice has signed a few large agreements with client firms. These agreements incorporate the Intelligent Voice technology into their own workflows. The new agreements include:

- VERINT – Is a publicly traded customer engagement company. The firm has developed a strategic partnership with Intelligent Voice to integrate its platform into the Verint Financial Services solution. The new system will integrate Verint's communication and analytics offer with the Intelligent Voice speech, voice, and behaviour analysis capabilities into a single platform.

- Shield – offers a leading workplace intelligence platform. Already offering services in protecting against fraud over text, the incorporation of Intelligent Voice software to their package allows for complete coverage of text and verbal communications and ensure regulatory compliance of employees on the service. This is particularly a concern in financial services, where remote working has made ensuring compliance more difficult than it was historically.

- IG Group – A large company specialising in online trading and investments will be incorporating Intelligent Voice into their call systems. This will monitor all calls and video sessions to ensure that regulations are being followed, while also simultaneously assessing customer satisfaction and measuring agent performance.

The company has also begun to develop elements of the overall offering as individual stand-alone elements. Not all companies are interested in the entire package as it has been constructed or are targeting different learnings from the platform outputs. This opens additional opportunities for Intelligent Voice, as individual components of the platform have more

potential use cases and markets than they originally envisioned. The company is also looking to develop the product further and is working to train its AI system to identify questions within speech, something that has been difficult to do to date. Identifying questions will enable Intelligent voice to work with its partners to ensure that questions posed by the public have been answered or can provide additional information afterwards if necessary. This is only the next element the company is working on, as they expect to continue innovating and adding new features and products continuously. Other areas that the company is pursuing include:

- Model shrinking – the current work still requires high levels of data and compute to operate.
- Model Security – the state of the art still requires you to give up your data to work on cloud or other facilities. The company is working on end-to-end encrypted data systems that can work on external compute without compromising secure data. They have a patent pending for this new technique.

For the research group at UEL, the experience of ongoing relationships with industry feeds into their teaching and produces a more relevant experience in their postdocs and early career researchers. As all of them will not stay in academia, this experience of co-development with industry has opened career opportunities for them in the London tech sector. At least four former UEL students and Post docs have been hired on by Intelligent voice after either completing an internship or a placement at the company. This pipeline of qualified students is attractive for both Intelligent Voice and UEL, with Intelligent Voice benefiting from highly trained staff and UEL students participating in cutting edge research while still in school.

The research team at UEL was able to drive forward the research in the field of AI during the project. The research team at UEL produced six publications based surrounding the core technology development, with additional work continuing after the project completed. The research team also applied for a patent on identifying markers in speech, although the patent is still pending at this time.

The success of the relationship between UEL and Intelligent Voice has become a model that they seek to replicate at the University. Liaising with cutting edge companies in the area promotes the sharing of ideas, supports academic research, and can provide career opportunities for participants. Promoting the work done under this project has convinced other companies and research institutions to engage with UEL, where no previous links existed. There is significant potential for future academic work at UEL to support further innovations at Intelligent Voice and other private sector firms.

B.1.4 Sources

- Interview with Dr. Julie Wall, Reader in Computer Science. Intelligent systems research group. Architecture, Computing and Engineering (ACE), University of East London
- Interview with Nigel Cannings, CTO Intelligent Voice
- Project Gateway to Research site: https://gtr.ukri.org/projects?ref=104817#/tabOverview
- https://www.ukri.org/innovation/industrial-strategy-challenge-fund/next-generation-services/intelligent-voice-combating-fraud-with-artificial-intelligence/
- PCF Forms
- Information on recent partnerships: https://intelligentvoice.com/news/

B.2 To investigate the use of AI techniques to augment the role of legal professions during negotiation

B.2.1 The project's environment

Negotiation is often a fraught process, one that is embedded with human emotions that can prevent good outcomes. This is particularly the case in family law, where parties have vested interests in the outcome of the proceedings. There are currently no techniques that can both monitor and record all written communications, while simultaneously examining those communications for coercive or abusive behaviour. Identifying such problematic behaviour would need to be carried out by solicitors, which may not be seen as neutral in the eyes of the legal parties. Manually examining all communications requires a great deal of time and effort, and challenging due to the potentially vast quantity of information.

If automated, this could greatly improve the speed at which assessment of communications could take place. It could also provide a neutral record of all communications on a case, readily available to the courts and all lawyers involved.

There is limited structure to negotiations, as they develop organically during discussions, negotiations, or disputes. As negotiations are conducted via different mediums (letters, emails and phone conversations) this data must then be manually combined to build a complete record. Records of communication are held by numerous individuals involved and contain private and confidential information that could be selectively edited leading to breakdowns in communications. This requires a lot of technology development work to ensure that these communications and systems are secure enough to store the data, without allowing access to unauthorized third parties across networks and platforms.

In the past, AI has been able to manage and assess data inputs when data has been added on mass, however this technology is not able to analyse communications in real-time nor has there been a system capable of assessing problematic behaviours. This presents a challenge, since identifying problematic behaviours after the fact offers limited benefit to vulnerable individuals. These systems are limited in their ability to adapt and learn as new inputs are received. To enable a software system to record and analyse intent of communications in real time, new processes and techniques need to be developed. This has not been applied to legal communications before, and requires adapting to the formalised communication techniques (i.e. Phone calls, emails, letters).

Whilst the immediate application for this technology is in legal services, there are opportunities for it to be transferred to a wider range of other applications. The team at Transparently is focusing on Family law in the short term, but it could be employed by any complex negotiation. This could include mergers, sales, other business negotiations, and many other legal processes.

B.2.2 Project profile

B.2.2.1 Project overview

Grant Summary
The project: To investigate the use of AI techniques to augment the role of legal professionals during negotiation
Strand: CR&D
ISCF NGS funding received: £138,352
Partner organisations: Transparently Limited (working with some external experts)
Status of the project: CLOSED (Mar 19 – Feb 20)

Transparently was in the process of developing AI technology that can track and assess intent in communications during discussions, negotiations or disputes. The grant from NGS allowed them to further test the feasibility of this technology, as they discovered early on in their development that existing techniques could not adapt to ongoing new inputs.

During the grant, Transparently was developing the AI technologies that can build a repository neutral and secure repository for all communications in any type of dispute. They are currently working to prove the technology works with their partner law firms and using legal experts to independently create a record of the communications to see if their system is capable of accomplish this task accurately. In proving that the concept works, Transparently hope to expand the types of interactions into other family court issues and beyond into other negotiations or communications.

B.2.2.2 The project participants

Transparently is an SME of developers that is working with a few legal experts as subcontractors. Transparently are pre-profit, and to date have been reliant on investors and grants to progress their technology. They have developed robust relationships with their legal experts and would work them again as the technology is further developed in the future.

The COVID-19 pandemic has driven the legal sector far more rapidly toward digital technologies than was anticipated when the project was initially conceived. With many legal firms and the court systems driven from their traditional courts and onto digital platforms, the types of services that Transparently can offer are seen as more in demand than ever before.

B.2.2.3 Project activities

The core work of this project is developing the AI tools that can spot suboptimal negotiating techniques. The in-house development team already had the skills in place to track communications but could not find any existing offering that could identify communications outside of the norm.

Through their NGS project, Transparently developed new software that was capable of keeping data secure on a diffuse network of computers such that none is kept on the company servers. This decision was made to keep the communications in as few places as possible, preventing unauthorized access. They have developed the standards and processes into the system to create a fully encrypted chain, ensuring it meets all legal and privacy requirements.

The new software was being tested by Transparently's existing legal partners during the project and have since been actively trying to promote it to others. The more beta testers they have testing the software, the more quickly the system can evolve and improve. The product remains two rounds of investment away from being fully commercialised, but the early prototypes have been able to accurately record communications and illustrate trends. This will ultimately create a new business model that could prove useful across the legal and business sectors. With the concept proven, the company is progressing in the development of the clear business offering.

B.2.2.4 Project delivery

As a result of the NGS project, Transparently was able to demonstrate proof of concept and that the company had a viable path to pursue further development. Managed to prove that the traits that they were looking for could be identified in live speech. This established concretely that the idea would be able to function in complex real world legal scenarios.

The next phase will be focusing on using real-time data inputs to show that the system learn in real time as additional inputs are added to a data stream. This next phase will likely take up to 18 months.

The company was able to complete most of the research work before COVID-19 fully impacted the UK in 2020. This meant that the core team were focused on the reporting phase of the project during the early lockdowns of 2020 and were able to progress on schedule and finish on time.

B.2.3   *Programme effects*

B.2.3.1   The role of the NGS programme

The ISCF NGS was one of the first funding opportunities that was directly focused on Transparently's intended field of legal tech and AI. They had been working with private funding for 3 years but had not yet received the kind of injection necessary to ramp up their development and develop an early version for testing. The ISCF NGS came at the perfect time, just as the industry recognised that there was a need to innovate and integrate new technologies into their processes. The success of their ISCF NGS application was a very useful tool in approaching potential partners and users, as the government backing increased the confidence of potential partners working with Transparently. Investors were also more open to supporting the project, as the ISCF NGS grant de-risked the project to a large extent. The grant also meant that the project would be able to come to market far more quickly than previously hoped, providing a massive boost to morale and support from external investors. Transparently had not yet earned a profit, so bringing forward the timeline, would be a significant boon to their investors and project partners.

Despite not requiring an extension, Transparently did apply to the COVID-19 call from UKRI, and received further funds to continue the research into the AI platform. This has allowed the team to incorporate more communication elements, providing a more detailed picture of how communications are progressing between parties.

B.2.3.2   Effects of participation on the organisations supported

With NGS support Transparently was able to develop new AI technology that can function with live inputs, but also operate securely on a diffuse network of computers. This will certainly have implications in other fields, although a broader application of this technology is only expected after the successful launch of the service to law firms.

Given that Transparently is still in the testing phase, it is still some time away from playing an active role in the market, although the company is hoping for its first open launch in 2023. Current work is being undertaken to trial the technology in live settings with willing partners, with the focus on law firms at present. The decision was made to offer the service to law firms at first, with the development of service for individuals expected after the initial launch. Transparently already has several professional partners in place and are scaling up to take more as they near the open launch next year. With a successful launch, the company is expecting to pivot toward a platform for individuals, that will be offered alongside the service being rolled out to law firms.

Since the project concluded the company has changed its approach to penetrating the legal services market and has chosen to engage with regulators to drive acceptance of their novel technology. In the past few years, although many law firms have recognised the potential for new technology, they are still hesitant to engage without regulatory approval. To mitigate this concern, Transparently has developed relationships with the Solicitors Regulation Authority and the Law Society to assuage the fears of law firms during the testing phase. The Solicitors

Regulation Authority has agreed to work with firms during the testing phase, mitigating the regulatory risks of using Transparently's service, and are considerably more likely to test, trial, and ultimate use the products in the long-term. The support of the Solicitors Regulation Authority has improved prospects in the near term, with more firms willing to participate in the final testing phases before the product launch.

In wider societal benefits, the company expects to initially support couples and others in family law courts during particularly trying times. Monitoring communications during these interactions is intended to better record and manage deteriorating relationships and prevent them from spiralling in more complex situations. The company also aimed to support the redirection of users to mediation and other services, preventing lengthy court battles, where possible. In the long term, this has the potential to lessen the burden on the court system and improve outcomes for the public.

Since the conclusion of the project, the company has been successful in both winning external awards and additional Innovate UK grants. Becki Cassia, one of the founders of Transparently, received a woman in innovation award to further expand the research in 2021. This award will focus on supporting women in high conflict couples, where domestic abuse is present. This included bringing in external experts to observe conversations and assist in the development of the platform. The company also won another grant from Innovate UK to 'Development of an enhanced communications feature to protect vulnerable individuals within Family Law' to build on the work completed during the ISCF NGS programme. This new project builds on the existing work by providing a platform for vulnerable individuals who are required to communicate with former spouses after the court decides on a case, or where co-parenting relationships are highly contentious. This is part of their wider efforts to broaden the use cases for their technology in the longer term.

The company has also been able to demonstrate the potential for this technology and have entered the Microsoft Start-up Programme. This relationship is beneficial to the company, as Microsoft can provide services and access to support that they would otherwise be difficult to afford or access. Many of the companies that participate in this scheme thrive in the long term, with the potential to be purchased by Microsoft or other large companies a distinct possibility in the future.

Ultimately, the project has propelled the company forward. The initial ISCF NGS grant, follow on grant, as well as subsequent UKRI COVID-19 grants, have been instrumental in demonstrating the potential of the company to potential investors. Despite concerns last year that investors may retrench due to COVID-19, the company has seen all its recent fundraising rounds nearly at capacity, with all previous investors committing additional funds.

B.2.4   Sources
- Project gateway to research site: https://gtr.ukri.org/projects?ref=104885
- Interview with founders Becki Cassia and Steve Stewart
- Transparently Limited: https://www.transparently.legal/
- Project gateway to new research project: https://gtr.ukri.org/projects?ref=96119

B.3 KnowRisk SC - Fusing data from Industry, Accounting, Insurance and Law to better identify, monitor and manage risk across entire supply chains

B.3.1 The project's environment

In today's globalised, interconnected business landscape, large companies rely on highly complex supply chains, where a small change in one can result in significant disruption to the other parties involved. This complexity makes it very challenging to identify risks and understand multi-stakeholder rights, obligations, and liabilities almost impossible.

Governance Risk and Compliance (GRC) guidelines for large organisations stipulate that all risks need to be properly managed, fully- disclosed and provisioned for. Provisioning for these risks from an accounting/audit, insurance and legal standpoint is dependent upon access to accurate, timely data to understand a client's exposure, liabilities, obligations. However, access to this data is challenging due to the complexity of these supply chains. This means that companies and their partners therefore can't put in place the appropriate mitigations to manage the risks involved. As a result, companies more than likely to be either over-insured/provisioned (expensive, inefficient) or chronically under-insured/provisioned (high degree of financial risk) leaving them vulnerable to legal or financial challenges.

Recognising this inefficiency, there is a strong desire from companies with large and complex supply chains and leading accounting, insurance and legal (AIL) companies to move towards the real-time, collaborative management of risks to improve productivity, realise efficiency gains and improve trust in the industry. Measure of risk in supply chain is a major focus of audits, an increasing focus of boards and a large untapped market for insurance companies. The key impediment to measurement of these risks is data sharing between corporate, legal, accounting and insurance data and documents.

B.3.2 Project profile

B.3.2.1 Project overview

Grant Summary
The project: KnowRisk SC – Fusing data from Industry, Accounting, Insurance and Law to better identify, monitor and manage risk across entire supply chains
Strand: CR&D
ISCF NGS funding received: £1,005,262 (Sweetbridge £512,222; Cystellar £148,383; Digital Catapult £163,221, Intelligent AI £113,936)
Partner organisations: Sweetbridge Emea Ltd; Industria Risk and insurance Services; Cystellar Ltd; Intelligent AI; Engine B Limited; Digital Catapult
Status of the project: Closed (Apr 20 – June 21)

The objective of this project was to develop an open-source proof of concept Blockchain-Distributed Ledger risk management platform to TRL 6 for sharing data and presenting risks along a supply chain in real time. The platform will improve data sharing and will be layered with standards, data sharing and access control policies for risk identification, legal agreements, accounting, continuous assurance, and risk management. As such, the platform will allow proactive measures to be taken instead of reactive measures after a risk event.

By fusing IoT, AI and distributed ledger technologies around standardised data models the project aimed to provide a platform for standardising, automating, auditing, and validating commercial transactions, rights, and obligations of any kind. This platform provides a protocol for decentralised, inter-enterprise continuous "assurance and control monitoring" to enable the

real-time identification, monitoring and provisioning for risks across an entire supply chain. Each chained block will comprise critical data that helps form a risk profile on areas such as provenance, safety and smart contracts that facilitate the flow of goods and finances whilst the distributed nature of the platform allows data/risk profiles to be accessed under access control policies without needing to centralize the data.

The project set out to develop a national demonstrator of the real-time risk management platform (TRL6) for corporations, insurers, accountants, and lawyers that allows them to identify, track and manage/provision for risks across entire supply chains in near real-time. This in turn aims to reduce the cost of insurance by an estimated 20% and risk exposure by 50% to 80%. With reduced risk comes lower cost of working capital particularly to smaller players in the value chain.

Whilst competitors have developed or are developing platforms to increase visibility across the supply chain, none use the fully integrated technology stack that KnowRisk will. As it stands, there are no platforms for whole supply chain connectivity, or for extracting and combining multiple data feeds from multiple steps along and across the supply chain, or for measuring risks across a value chain.

B.3.3   The project participants

B.3.3.1   The project is being delivered by a consortium of organisations:[79]

- **Sweetbridge** (Lead partner) is an SME specialising in standardizing and automating financial process audit as well as fraud prevention via Synchronized Accounting. Within the project, they provide the models and data sharing and access control policies of identity verification, legal agreements, accounting, and risk management.

- **Intelligent AI** (Previously Agile Datum) is an SME developer of AI and machine-learning tools for the financial services industry and in the project provide corporate liability risk assessment and claims.[80]

- **Digital Catapult** is a government innovation agency who provide consortium governance and independent oversight on all the non-technical ethics, bias and privacy issues that may arise from the data.

- **Engine B** is a leading digital standards initiative led by KPMG, incorporating EY, Deloitte, PWC, BDO plus four midsized accounting firms, several magic circle law firms and Microsoft, to encourage data sharing alongside common data standards. Their role in the project is to define (through a series of workshops) and provide the AIL data and data standards for accounting, legal and insurance data,

- **Cystellar** is a geospatial intelligence SME focused on delivering real-time insights for the insurance sector and provide geospatial tracking and analysis of crops, sustainability, chemical use, and supply chain verification of IoT devices.

- **Industria** is a consulting and development firm at the intersection of deeptech with the design for creating pervasive changes and bringing commercial value for enterprises.

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79 The project consortium initially included R3, and SME blockchain software company, however they dropped out of the project due to issues around financial checks.

80 Intelligent AI were not initially an official partner in the project as they didn't pass financial checks so joined the project as a sub-contractor. They joined the project as an official partner at a later stage.

Prior to the project, Sweetbridge had long-standing relationships with Engine B and the Digital Catapult and had been in discussion with Cystellar. Sweetbridge connected with Intelligent AI (Previously Agile Datum) through the NGS Innovation Lab.

The consortium is also supported by a collaboration with a former chief product officer of SwissRe, the world's largest reinsurance company interested in the creation of supply chain disruption insurance, and the UCL Blockchain Consortium to serve as Observers. Their non-grant claiming contribution, collectively valued at over £1m over the 12-month project, aimed to enable these organisations to be part of the national demonstrator and develop routes into a new market.

The project is also supported by a number of sponsor organisations from application sectors. This includes organisations from the food & drink sector (Sainsburys and the FSA) and construction (Trowers and Hamlins LLP, Black & Veatch Consulting and Joint Contracts Tribunal), who are contributing data to the project.

B.3.3.2   Project activities

The project is comprised of two main phases. The first 12 months of the project involved developing the platform to TRL6 with NGS support, after which it underwent iterative development in line with real world testing. The project expects to launch the platform to market in 2023.

The project is focused on collecting, standardising, and utilising the risk data of all parties in the supply chain, including AIL partners, and transforming this into a distributed platform that implements common data models under access control policies without needing to centralise the data.

The project also sought to embed ethics into the practice and deployment of AI. Working with outside experts at the University of Edinburgh and the University of Cambridge, the team developed an ethics framework alongside an ethics roadmap for others to follow. The core of this centred around data privacy, data and AI ethics, governance, and business model innovation.[81]

To support the development of the exemplar use case, the project is supported by sponsors from within application sectors to provide data for the project to work with. Originally, the Food and Drink sector was to be the primary test case with Sainsburys committed to providing data. However, due to COVID-19 these partners have had to focus on dealing with the impacts on food supply chains and have been less able to provide the data needed. Whilst these organisations are still committed to the project, the delays have forced the consortium to switch their primary use case example to construction and re-do their project plan. As Sweetbridge has another major project in the US working with construction, they have been able to access the required data. Sweetbridge also engaged in discussions with three major construction companies or construction aligned professional services organisations (Monarch Windows, Ferreira and US Offsite) to join as sponsors.

The project is comprised of five primary workstreams:

Table 18 Overview of project workstreams

Workstream	Focus

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81 https://knowriskconsortium.com/ethics-policy/

Modelling node risk	Risk of a node in the supply chain having some problem. Intelligent AI and Cystellar have been able to introduce new AI technologies which bring additional data about risks and create a digital twin of that data. This has been highly attractive to insurance companies because it automates their existing processes.
Modelling flow risks	The material in the chain doesn't move, either because the suppliers do not have the products in stock or there is something preventing the flow of products between nodes.
Measuring risk	Risk modelling
Contract risks	Risks in supply chain coming from contracts. Produced a peer reviewed white paper around the methods used. Sweetbridge has been able to demonstrate a way of measuring supply chain disruption risks that are linked to a specific event in a contract between counterparts.
Platform user interface	Developing the platform's user interface such that it can illustrate the risks and outputs of the platform in a manner that is understandable to its users.

Given the cross-cutting nature of the platform, the project has 5 significant stakeholder groups, all of whom are potential customers (accounting, law and insurance firms, government, and the firms within application sectors e.g. Food or Construction). To engage with these groups, the project has completed three events to support awareness of the project. These three events were conducted in late 2020, and each focussed on different groups of stakeholders:

- Participants contributing to the project from Food and Construction
- Government players in construction and food supply chain– coordinated by the Digital Catapult
- Law and accountancy – coordinated by Engine B

The project conducted one on one briefings with insurance firms and lawyers to get their feedback on the clickable demo and inform its future development. The project team also conducted a series of workshops with the target users of the platform to get their feedback on its functionality and interface. These workshops served as an opportunity to start teaching potential customers how to use the platform.

These demonstrations have led business leaders to consider how their operations may start to change over time as information becomes more applied to supply chain risks and business services. The novel tools developed as part of this project allow people to make continual adjustments that would have required sophisticated, very knowledgeable, and expensive resources, and would never have been practical to do on a regular basis. Project members demonstrated that the ability to automate risk management, to a point where it could be done cost-effectively, will have a profound impact. This has encouraged end-users to consider the ways in which financial services related to risk management will change in the future.

As part of this project, Digital Catapults produced five reports on behalf of the KnowRisk consortium all of which were informed by outputs from workshops and policy engagement sessions with government and industry representatives. The list of outputs includes reports on i) ethical concerns arising from new technologies; ii) AI ethics tools to enhance the transparency of federated learning systems; iii) risks within the construction supply chain and barriers to

introducing new technologies; iv) supply chain risks within the food and drinks; and v) federated learning as a service[82].

B.3.3.3   Project delivery

Despite the rocky start due to the change in consortium partners, the project has recovered and partners are confident it will be a success. All the technological objectives have been achieved. The project has exceeded expectations in terms of market adoption and interest from end-users. As such, the consortium has formed a legal entity ahead of moving forward to the commercialisation stage. Sweetbridge EMEA have engaged in conversations with three separate organisations, and they expect those conversations to close into a commercial success.

B.3.4   *Programme effects*

B.3.4.1   The role of the NGS programme

The motivation for applying to NGS programme was primarily to provide the capital necessary to develop the proof of concept and demonstrator of the platform. Whilst Sweetbridge had been able to develop the platform to its TRL3-4 stage using largely private capital, they had struggled to identify sources of public funding that aligned with the project or understood its potential, particularly due to its cross-AIL integration. As such the funding from NGS has been critical for this project to progress further and has demonstrated legitimacy to investors.

The project was formed following the NGS Innovation Lab, through which the partners connected with Intelligent AI. The partners received encouragement and positive feedback on their ideas at the NGS lab from multiple AIL parties. This feedback enabled the parties to obtain support from their investors which was critical for the provision of matching funds. Without the NGS Lab the consortium might not have been successfully formed.

B.3.4.2   Effects of participation on the organisations supported

The COVID-19 pandemic and its impact on supply chains (especially for food and PPE) has highlighted the sensitivity of supply chains and the limited connections between accounting, legal and insurance and their limited ability to share data and coordinate. As a result, the project has received significant spike in interest from both government and industry for a range of application sectors, some of whom supported the development of the platform through to a pilot phase (i.e. proof of concept events to show people the impact of the project).

While the product is expected to commercialise in the next year, the team has already generated revenue from pilots, including a pilot with one of the largest insurance companies. These pilots were secured after completing live clickable demos of their product, and receiving positive feedback from various people, including the Head of Innovation at Lloyds. Overall, the feedback they have received from end-users suggests that the product provides highly innovative solutions which help to reduce supply chain risks instead of simply spreading the costs out.

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82 KnowRisk report: using digitalisation to transform the supply chain, December 2021, https://www.digicatapult.org.uk/news-and-insights/publications/post/knowrisk-report-using-digitalisation-to-transform-the-supply-chain/

Sweetbridge Emea have also been in contact with the British Standards Institute in relation to a large government project that will seek to apply this technology for food trade supply chains in preparation for the impacts of Brexit, or a possible second wave of Coronavirus.

The partner companies involved have all gained knowledge and skills through their collaboration as well as exploring new areas of research. For example, the partners have all learnt a great deal about computable contracting, an emerging area of technology in which AI models understand workflows and risks within a contract.

The project has also allowed the project partners to explore the use of Federated Learning, a relatively new branch of AI in which AI can be trained by multiple user simultaneously as they use the platform over time. This technology could then have multiple applications beyond the project.

As a result of the project, Sweetbridge's other project with US construction companies has grown in scale as these industry partners are interested in including aspects of the learning and outputs of the KnowRisk project. Sweetbridge are also in disucssions to form another very large project within the construction industy. The team is actively working on creating an entirely new insurance product for the construction space, and they have commercial customers in the US who have expressed an interest in purchasing the product. This backlog of premium value risk management products is values at around $2 million. Sweetbridge have also received interest from South African companies to apply this technology to animal husbandry supply chains.

This market opportunity to create a radically new product, combined with the affirmative feedback from insurance companies and the boost from the shift in outlook caused by the pandemic, helped to drive a much better working relationship between team members. These factors created an environment where there was a relatively easy way to get verification for funds. The Sweetbridge Ecosystem has raised £10 million in private sector investment to support the activities delivered in this project. These funds have allowed them to hire six more employees and bring the project to the commercialisation phase.

The success of this project is attributed to two main reasons: first, project members have really deep experience with large scale projects and have very good leadership skills; and second, there's an economic awareness that working together is going to generate a higher collective benefit for the team than summing the individual parts of each partner separately. Being part of the project has allowed some of the partners to raise significant additional funding because they have been able to attach themselves to something which is much larger than their value proposition by itself.

As a result of being a member of the consortium, the AI ethics team in Digital Catapult has grown in size, from one small offering to a large department with 10 consultants. The KnowRIsk project played a significant role in helping them expand their product offer and improve their ability to help SMEs gain a better understanding of the ethical risks within the supply chain. The Digital Catapult chose to revise their own ethics framework due to the project outcomes. The knowledge transfer from this project has also allowed the team to win additional external funding to deliver the Digital Innovation Supply Chain Innovation Hub, a large project working with SMEs to help improve the resilience and transparency of supply chains in the UK.

B.3.5   Sources

- Inteview with Scott Nelson and Alan Chute, Sweetbridge Emea
- Interview with Yogesh Valdyanathan and Hassan Mahmud, Digital Catapult
- Project Gateway to Research site: https://gtr.ukri.org/projects?ref=106157

- Participant websites:
- Sweetbridge Emea Ltd (https://cms.sweetbridge.com/sweetbridgeemea-com/)
- Digital Catapult (https://www.digicatapult.org.uk)

B.4 Technology Driven Change and Next Generation Insurance Value Chains (TECHNGI)

B.4.1 The project's environment

The insurance industry in the UK is the largest in Europe and plays as essential part if the UK's economic strength. With around 305,500 employees, the insurance sector contributes ~£35bn

to the UK economy and exports of insurance and pension services were £17.6bn in 2016, some 7% of total services exports.[83] AI is rapidly becoming an important technology in the insurance industry with potential for instigating transformative changes that will dramatically reshape the industry. This includes technologies such as machine learning, distributed ledger, automated processing as well as profiling the impact of the rapid increase in available data (e.g., from social media and the 'internet of things') for business analytics and modelling.

Business transformation based on AI and other data technologies depends on developments and interaction with i) innovation in business processes for development and implementation of new technologies, ii) new technology-based business models, and iii) changes across the wider insurance value chain. For the UK to maintain its leading position, companies, regulators and policy makers need a strong understanding of these opportunities and barriers to this AI enabled transformation to be able to continue to support the sector.

B.4.2 Project profile

B.4.2.1 Project overview

Grant Summary
The project: Technology Driven Change and Next Generation Insurance Value Chains (TECHNGI)
Strand: Research Grant
ISCF NGS funding received: £1,304,485
Partner organisations: Loughborough University, SCOR Global, IBM, Price Waterhouse Cooper, Willis Group, Lloyds, Z/Yen Group, BGL Group Limited, AXA-XL
Status of the project: Ended (Dec 18 – Jan 22)

The TECHNGI project explored AI technology and insurance landscapes to identify current and future applications of this new technology, to model and understand the nature of business transformation in terms of business model process change and innovation, and transformation of the overall insurance value chain. This includes identifying and mapping the current landscape including the opportunities, enablers and barriers to adoption.

The outputs of the project were designed to benefit several different user/stakeholder groups within insurance in the following ways:

83
https://www.abi.org.uk/globalassets/sitecore/files/documents/publications/public/2016/keyfacts/keyfacts2016.pdf

- **Staff working within the insurance value chain:** providing understanding of opportunities for data-based improvements to internal processes (i.e., risk modelling and underwriting), insights into business and organisational challenges arising from application of AI, best practice examples and success factors to successful adoption of these technologies

- **InsurTech start-ups:** providing a better understanding of the business requirements of new technologies

- **Senior management within industry:** providing strategic insight into changing business models and opportunities for cooperative development of standards and supporting technology

- **Regulators, compliance officers and policy makers:** providing improved understanding of insurance business models and how they're affected by technological change, recommendations for better alignment of regulation and the development of regulation of new products and technology supported business models, understanding and supporting opportunities for using technology for regulatory compliance

The project produced research-based empirical investigations and a series of industry case studies that presented best practice and facilitating/challenging factors to the implementation/adoption of these new technologies. Supporting this were options for promoting adoption relevant and appropriate to different groups, in both the short and medium term at the level of specific business processes, and in the longer-term through influence on strategy and policy.

B.4.2.2 The project participants

Led by the University of Loughborough, the project brought together a multidisciplinary team of 10 academic researchers from different academic departments across Loughborough who were supported by industry partners. The project team collaborated with a series of major firms across the insurance value chain as participants, from risk specialists through to digital comparison tools and customer engagement.

The project leveraged an additional £237,000 from the partners in the insurance industry. These industry organisations supported the project in the following ways:

- **IBM UK** (developing technology solutions for insurance): Providing insight into application of AI, providing staff time and hosting meetings over two-year period

- **SCOR Global, PWC, Lloyds, AXA-XL, BGL Group Limited** (insurance firms): Providing insight into application of AI, providing staff time and hosting meetings over two-year period

- **Willis Towers Watson (Willis Group)** (insurance broker): Providing support to the project through provision of venue for TECHNGI conference, staff time to organise event, videographer, advertising and PR through Willis Network.

- **Z/Yen Group Ltd** (commercial think tank): Providing insight into application of AI

Jaguar Land Rover Automotive PLC was previously involved as an industry partner in the project however stepped away from the project due to business demands.

The project was supported by a steering committee comprised of industry partners which is responsible for reviewing project activities quarterly.

B.4.2.3 Project activities

Over the course of the project delivery, the various activities were divided across:

- **Identify and Explore AI Opportunities:** Providing a clear and comprehensive summary of the main opportunities from the application of AI in insurance. This phase included mapping

current, known AI initiatives across the insurance value chain, creating a typology and assessment of insure-tech start-ups and conducting a Delphi survey of industry and policy stakeholders of factors including adoption and growth of AI.

- **Identify barriers for adoption and enablers of BPR, business model innovation and industry transformation:** Developed empirically tested models of what needs to be done to support the successful application and adoption of AI in the insurance industry (and of other data technologies such as machine learning, automated processing, expert systems, distributed ledgers and big data analytics). The phase included development of different case studies: We have 7 shorter case studies about UK-based companies active in InsurTech; 3 case studies focusing on behavioural insurance in global shipping industry, behavioural insurance in automotive industry, and customer life cycles in the insurance industry. Additionally, two international cases (Ping An and TESLA insurance) were produced and informed the article "Artificial Intelligence and Digital Transformation of Insurance Markets", (published in Capco Institute Journal of Financial Transformation).

- **Develop frameworks and solutions to facilitate and enable the successful adoption, deployment and growth of AI technologies at each level of innovation:** Created tools and frameworks of knowledge to allow practitioners and policy makers support the development and adoption of AI technologies. Phase included producing summaries of knowledge on how AI systems work, synthesis of case library and survey results, producing adoption, deployment and growth implementation frameworks, and making proposals and recommendations for future regulatory direction/needs.

The research strategy and empirical investigations were based on close engagement with industry partners and co-production of research. These industry partners were involved in the project in both empirical investigation and through the development of case studies that established aspects of deploying AI in insurance. This engagement included practitioners from within these organisations working in a range of business functions (strategic roles, specific business areas across product lines and operational processes, risk analytics, technology). In doing so, the project produced research outputs relevant to their target user groups with practicable options. Moreover, the case studies provided industry collaborators with an opportunity to discuss and reflect on their strategy and actions.

In addition to industry partners, the research team supported policy development during the project. The team were involved in three separate guideline committees - twice working with the European Insurance and Occupational Pension Authority (EIOPA) in support of the policy development on ethical and transparent us of AI and responding to the European Commission's call for consultation on AI. TECHNGI input has been referenced in EIOPA's report on AI governance principles and a publication on the development of AI and ethical framework by EIOPA. According to the PIs, the work of EIOPA is important for UK companies that wish to operate within the EU. The project has also received attention from UK regulators, including the Bank of England and the Finance Conduct Authority (FCA). There are plans to produce two high level reports based on the project findings - one would target managers and the insurance industry but the other would provide insights for governments.

The project produced a series of reports and papers reflecting the focus of individual work packages. This included management strategy and policy papers, mapping of projects, evaluation of insure-tech start-ups, innovation case studies, readiness assessment tool for organisations, implementation frameworks and summaries of knowledge. Furthermore, the research findings were published as academic research papers and conference proceedings; during the period of 2019-2022 the project resulted in 44 publications.

Figure 19 TECHNGI publications
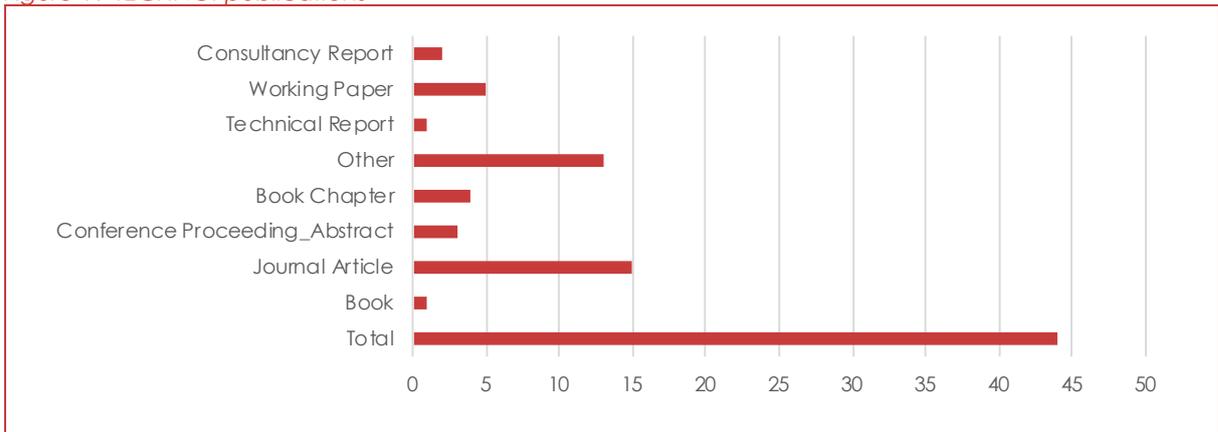
Source: NGS Research Fish Submissions

The project's **dissemination** strategy included direct engagement with companies through the research, a series of knowledge exchange workshops and a series of additional outputs (videos, traditional and social media outputs) and presentations at industry conferences & events. Partner organisations supported some of the engagement efforts (i.e., Willis Towers Watson facilitating conference, both in venue and fostering attendance). The table below provides a summary of all engagement activities and the primary audiences.

Table 19 Overview of project engagement activities

	Policymakers/politicians	Industry/Business	Media (as a channel to the public)	Professional Practitioners
A broadcast e.g. TV/radio/film/podcast (other than news/press)	0	3	0	0
A formal working group, expert panel or dialogue	5	17	17	4
A magazine, newsletter or online publication	0	2	1	0
A press release, press conference or response to a media enquiry/interview	0	1	0	0
A talk or presentation	0	9	0	1
Engagement focused website, blog or social media channel	0	2	2	1
Participation in an activity, workshop or similar	0	23	0	1
Total	5	57	20	7

Source: NGS Research Fish Submissions

The project delivered a one-day conference in November 2019 in collaboration with the Willis Research Network to present a range of perspectives on the applications of AI for insurance and its implications. The conference was attended by 300+ industry representatives, prompted further contact with the research group and resulted in a publication. In late 2021-early 2022 a

series of five virtual conferences were held, each conference focusing on a different topic discussed across several panels. These topics included: ethics of using AI in insurance; use of AI in insurance start-ups; impact of AI on insurance business models; regulation of the insurance industry.

The project had secured a no-cost extension to September 2021 but as of March 2022 is still active. The project had experienced delays, with researchers noting the timing of certain work-packages/activities having shifted slightly - phase A taking longer than expected, delays to launch of the Delphi survey due to negotiations with project partners, and the impact of COVID-19. Notably, some industry partners originally involved in the project had stepped back due to business demands.

Project partners also noted that the switch to remote working and meetings has been more efficient for the project overall. While the initial disruptions due to COVID-19 resulted in the need for extensions (which were offered to the team by NGS), overall, the PIs felt that the team managed to pivot towards leveraging IT in data collection and dissemination (distance calls, online meetings, conferences).

It was even suggested that the (near) universal switch to online work may have benefited the data gathering process as it became more flexible to schedule online meetings as opposed to in-person meetings. Industry representatives were likewise found to be more willing and interested in providing input for the project via online communication channels as these became the norm during the pandemic.

Following the official closure of the project, the PIs continue to engage with the results. In addition to further publications based on the research results (the expectations are that continued research work could last between six to twelve months) dissemination also remains an important topic. Insurance has been regarded as a large industry with a significant number of actors of various sizes. Against this backdrop, the project team argue that their approach produced high impact and high-quality results through analysis of specific insurance cases (i.e., TECHNGI research contributes to the framework of EIOPA's artificial intelligence governance principles; article on digital transformation of insurance markets published in Capco Institute Journal of Financial Transformation). It is expected that future impacts on industry will emerge following targeted dissemination (i.e., publication in the Capco Institute Journal of Financial Transformation, articles published through Willis Towers Watson which have a readership of financial and insurance industries).

B.4.3   Programme effects

From the perspective of the project partners, the motivation for applying stems from the understanding that technology is driving most of the innovation within business. However, whilst a great deal of attention was given to the technologies, there is a fundamental need to understand the context in which these technologies are adopted by businesses. To better understand the implications of AI for the insurance sector, project partners leveraged their strong history of conducting applied research in the areas of technology and business innovation, marketing, economic policy across a wide range of sectors.

Prior to applying to the NGS programme, Professor Milne delivered a relatively small project (~£170k from NERC) focussed on developing a software solution to support decision making around managing flooding risk in Indonesia. Through this project, TECHNGI researchers

identified Loughborough's strength in the area of insurance and the multidisciplinary expertise with applications to the NGS posed research problems.

B.4.3.2 Effects of participation on the organisations supported

As a result of their NGS project, the team at Loughborough have been able to further build and consolidate their multidisciplinary team across the university and build further collaborations. This has increased the profile of their respective research groups within the university.

In the future, the project team hope this project will serve as the foundation for a whole programme of research focussed on the application of digital technologies and services. A concrete example is how the project helped make AI an important part of the research done at the Loughborough University Centre for Information Management. According to the PIs, before the project there was an awareness of AI, but following TECHNGI it is now a core part of the Centre's activities. Each PhD will benefit from industrial supervisors and advisors from the WTW network and access to relevant data and practitioners to contribute to their research.

Participating in the project has allowed Loughborough University to build a team of insurance experts and to develop the sector knowledge needed to secure additional funding. Team members have also been able to enhance their skills and knowledge in AI, data analysis and methodologies, as well as managing projects of large scales. The project was also a networking opportunity for stakeholders and core team members. As a result, new partnerships are emerging to continue working on joint projects.

A demonstration of this is the establishment of the Mini-Centre for Doctoral Training in Industry and Commercial Property Insurance. The newly established centre is joint funded by WTW Research Network and Loughborough University, building upon the strength of their cooperation built as part of the TECHNGI project. The Centre will run from July 2022 until September 2026 and offer six full fee PhD scholarships to support research on the adoption of digital technologies (including AI) within these insurance subsectors.[84]

The benefits of this project are expected to reach insurance firms considering AI adoption. The important consideration is the time for research outputs to translate into impacts which, according to the PIs is both uneven and difficult to predict. As an example, the theoretical work on the use of AI applications throughout the customer insurance lifecycle was used to structure the AI landscape in the development of EIOPA's Artificial Intelligence (AI) governance principles for consumer insurance applications. For other strands of research, the impacts are emerging as the research team continue to publish articles in high quality journals that target insurance industry readership.

While it is difficult to monitor impacts at the company level, project members believe that the resources they have created can help companies in the industry make more informed decisions. With plans to continue with dissemination and further publications, the impacts of TECHNGI on insurance companies should continue to emerge throughout 2022.

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B.5 Innovating Next Generation Services through Collaborative Design

B.5.1 The project's environment

Professional service firms (PSFs) are facing increasing challenges from AI and machine learning technologies. Whilst these technological innovations are important for growth and productivity, how they are integrated into business practices and business is of critical concern.

Adopting AI challenges the existing business models of PSFs, particularly their revenue model (i.e. the way they operate to make money). Therefore, adopting AI is not a straightforward task but requires companies to think about what and how they need to change in order to accommodate the new AI technologies. Mid-market firms with turnover between £5m and £250m are particularly sensitive to technological change due to their size, the threat of competition, and resources.

B.5.2   *Project profile*

Grant Summary

The project: Innovating Next Generation Service through Collaborative Design

Strand: Research Grant

ISCF NGS funding received: £1,437,084 (Including core project grant of £743,995 plus additional funds for uplift projects) for the period of Dec 18 - Jun 20; a further £824,994 was received for the period of Jun 20 - Feb 22

Partner organisations: Oxford Brookes University (previously Sheffield University, until the PI became the Pro Vice-Chancellor and Dean of Oxford Brookes Business School) ; Loughborough University; University of the Arts London; Lancaster University; University of Manchester (TheCityUK, Managing Partners Forum, Litig)

Status of the project: LIVE (Dec 18 – March 21; uplift project live as of March 22)

The project examines the added value that mid-market accounting and law firms can gain from leveraging the potential for AI technologies. More specifically, the project focuses on the ways in which businesses can think about changing the way they work through a collaborative design model that considers current and future pathways for AI technologies and the broader, dynamic institutional landscape.

To do this, the project is synthesising insights from business model innovation, operations management, studies of PSFs, developments in AI, and service design to understand how innovation in PSFs is adopted and assimilated. The project team are then connecting these multidisciplinary academic insights with the on-the-ground understandings and perspectives of innovators in PSFs through workshops, focus groups and interviews.

Whilst the project is driven by academic research, it is focused on the translation of this knowledge into tools that firms can operationalise and apply. To do this, the insights generated are applied to developing prototypes of solutions, designed in collaboration with firms, to enable companies to generate and assess the potential applications of AI across their business model.

B.5.2.2   The project participants

The project team is comprised of academics from five UK Universities (Oxford Brookes University; Loughborough University; University of the Arts London; Lancaster University; University of Manchester) each bringing expertise in design thinking, machine learning, management, innovation, operations and professional services.

The project is collaborating with Normann Partners providing their expertise in strategy consulting, as well as Litig and TheCityUK on two further, more focussed uplift projects (detailed in the table below).

The project is also supported by their Advisory Board who provide expertise from the legal and accounting professions, as well as experience of AI. The membership of the Advisory Board is presented in the table below.

Table 20 Project Advisory Board membership

Accounting	Law	AI technology / Other
Institute of Chartered Accountants in England and Wales (ICAEW) Kingston Smith	DWF Ventures Law Society of Scotland RPC Wavelength Law University of Oxford Mishcon de Reya LLP Solicitors Regulation Authority (SRA) Cilex Regulation	Neota Logic Professional & Business Services, BEIS University of York Hyperscale Group The City UK

Source: Project website. https://www.nextgenpsf.co.uk/home

The consortia includes a combination of existing and new collaborations for the project partners. Prior to the launch, the who were also PI and several of the partners were working on a pilot study, examining the uptake of AI in legal and accounting services before the NGS programme went live. This pilot work, in addition to other projects, brought the various members of the consortia together through different avenues of interest and at levels of engagement.

B.5.3   Project activities

The project was delivered through five work packages which are structured around three phases (see figure below):

- **Phase 1: Exploring** was about exploring and scoping the landscape that legal and accounting firms operate in to understand the drivers and inhibitors to the adoption of AI. This involves mapping key stakeholders and their roles/spheres of influence, conducting reviews, interviews, focus groups and workshops with firms, researchers and wider stakeholders to understand the adoption, diffusion and challenges to AI adoption for firms.

- **Phase 2: Designing Strategies** was about working with mid-market firms and stakeholders to design strategies to support the effective implementation of AI technologies. This includes delivering 'Design Sprints with Firms' in which the research team works closely with a group of people (through interviews and workshops) from one or more firms to undertake a focused, time limited project to explore the potential for AI implementation and enable companies to be active co-researchers in developing strategies for AI adoption. This phase also includes running training sessions with participants from firms in design thinking to build capacity.

- **Phase 3: Synthesising** was about cascading the learning from the project to a wider group of firms to support the future competitiveness of next generation service firms. This includes translating research insights into multiple formats and media, including reports and publications, generating an AI Innovation Barometer, Futures Scenarios and Service Innovation Toolkit, conducting workshops with firms to further develop strategies and roadmaps, and a Policy Sprint workshop with ~30 policy advisers including civil servants to explore the implications of findings for systems innovation, and to co-create policy options together.

Figure 20 Project workplan
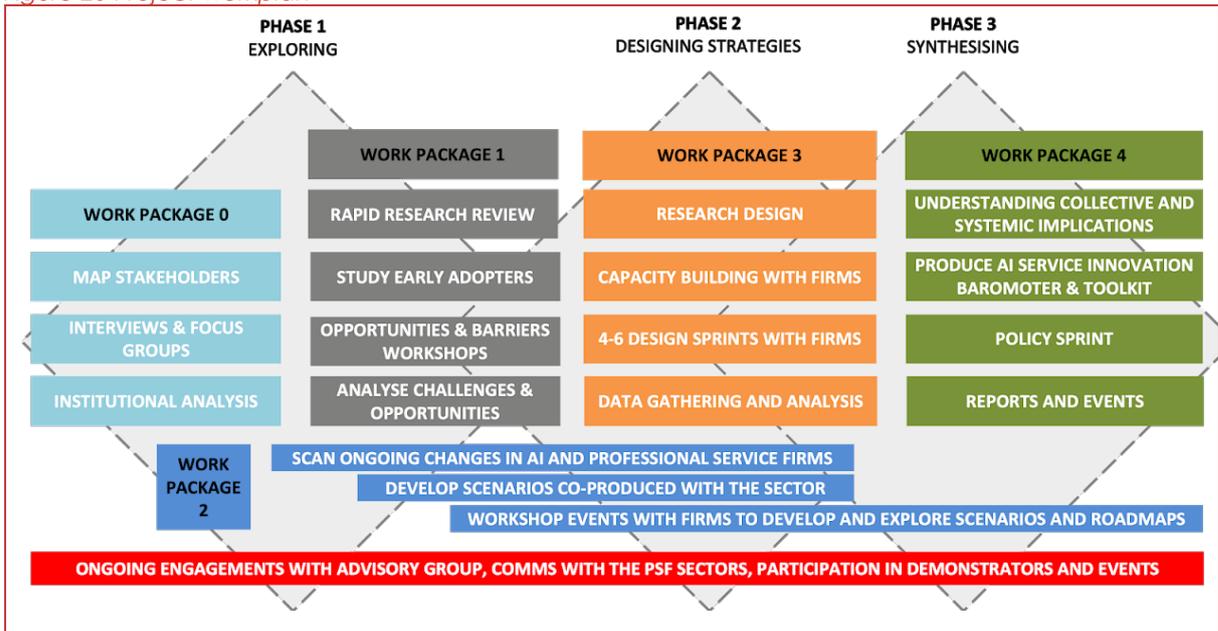
Source: Project website: https://www.nextgenpsf.co.uk/home

In addition to the core project looking at the AI readiness of mid-market legal and accountancy firms there are a series of related scoping projects that have spun out of the initial project each exploring different aspects of AI, digital and technology in the professions. These projects have been supported through additional funds made available by the ISCF NGS programme and are summarised below. These projects ran in parallel to the activities of the core project, providing complementary insights to the core project. The project also received a further £80,819 from the NGS programme for additional admin support, travel and subsistence and transcription costs. Beyond the uplift funding, the project itself received a further £824,994 to extend its running period by 20 months, from June 2020 (the initial project end date) to February 2022 due to COVID-19.

The project has good connections with other NGS strands, including:

- Collaboration of Sheffield University in the £1.7m NGS CR&D project 'Powering an open age of professional services using Engine B', led by Engine B[85]

- Regular, informal meetings with research teams from the other two ESRC NGS funded research projects

- The joint uplift project with Professor Alistair Milne (Loughborough University)

- Using the AI for Services Network to publicise their webinars

The project has released two toolkits, that are designed to work together to support adoption of AI by businesses. The first of these is a **Business Model Innovation & AI readiness Toolkit**[86] **(BMI)** that helps business understand how they create and capture value from their activities and to think about innovation more broadly to integrate specific AI related considerations. The output was the. The Toolkit uses a deck of cards with prompts to encourage firms to think about how

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85 March 2020 – Feb 2021, https://gtr.ukri.org/projects?ref=106158

86 UKRI (2022). Innovating Next Generation Services through Collaborative Design - Outcomes - Research Tools and Methods. Available at: https://gtr.ukri.org/projects?ref=ES%2FS010475%2F1#/tabOverview

AI can enhance and/or optimise and/or automate different aspects of service delivery. BMI has proved useful in stimulating the legal and accountancy firms to think about AI adoption because adopting AI challenges the existing business models of PSFs, particularly their revenue model (i.e. the way they operate to make money). BMI showcases how adopting AI is not a straightforward task but requires companies to think about what and how they need to change in order to accommodate the new AI technologies. In addition, the project delivered bespoke firm-based sprints where the project provides a more tailored approach and participating companies had the opportunity to explore AI adoption by engaging with the BMI Toolkit in more depth and work on specific firm challenges. The workshops received positive feedback from the firms, with those participating in the bespoke sprints planning to take forward the solutions developed through the workshop. In some cases, the project team have also been invited to support the companies further in the development and adoption of the solutions.

The second toolkit is the **Collaborative AI Readiness: Design Toolkit for Professional Services Firms**[87]. The toolkit offers a methodology based on design thinking and scenario planning that businesses can use to evaluate the use of AI in their operations. The purpose is to allow businesses to understand the AI landscape (via mapping information), areas where AI could be introduced, the likely changes and added value of using AI.[88] As part of the AI toolkit, the project has delivered 16 multi-firm **design sprints**. These are activities meant to provide an exercise for businesses that would challenge their perception of the business environment while offering participants the opportunity to explore AI adoption by thinking about and challenging their current business models. These cross-firm workshops and sprints are more generic in their content and serve as a platform to support more in-depth and firm specific interactions. The toolkit is available either a free download (PDF format) or a published book (both softback and hardback).

The contribution of firms in design sprints equates to around £5,100 of in-kind contributions.[89] The workshops will continue to engage with firms in the sector to promote AI adoption more widely. The ultimate goal is to refine the design sprint methodology around the BMI Toolkit to enable firms to organise and deliver the sprints on their own.

One of the challenges the project has faced in delivering these design sprints has been around ensuring engagement from firms. Whilst firms are willing and interested, the billable hour model used by accounting and legal firms is limiting especially where companies do not have 'charge codes' against which workshop attendees can log their time. As such, some workshops have had lower attendance than expected. Another challenge linked to attendance was scepticism of government funding and hesitant to share their data and information. In some cases, firms have tried to get the project to put NDAs in place. The project team continues to leverage the existing communication channels, including the contacts, networks and the resources of the Managing Partner Forum, to promote use of the available resources, especially the Collaborative AI Readiness toolkit which (as of March 2022) is in its 2nd printing (in addition to being available digitally). The project team also continue to improve the digital version of the toolkit for better user experience. Overall, the project produced 13 publications.

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87 Idib.

88 NextGenPSF (2021). AI Readiness Toolkit. Available at: https://www.nextgenpsf.co.uk/ngs-toolkit

89 In-kind contributions understood as the value of the time firms commit for employees to participate in workshops and design sprint activities and is valued at a flat rate of £600/hour.

Figure 21 Innovating Next Generation Services through Collaborative Design publications
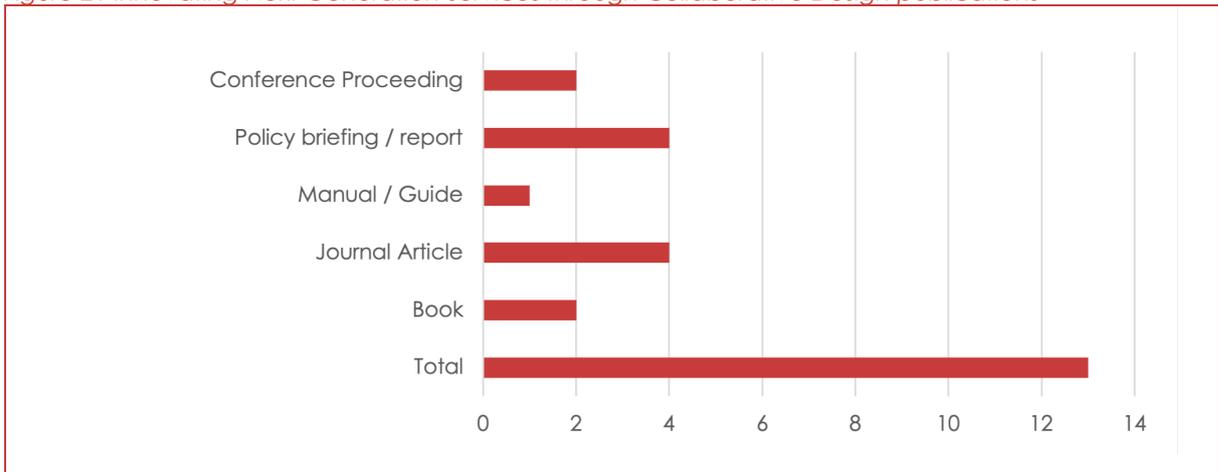
Source: NGS Research Fish Submissions

The nature of the pandemic has also created problems for the team because the core deliverables of the projects were meant to be done face-to-face. This is due in part to the importance of the workshops in building capacity within the firms' team and fostering cultural changes, which are much more challenging to translate to online platforms. Instead of conducting one-day on-site sprints, the team pursued a series of online seminars which allowed them to engage with different groups and to raise the profile of the project. The team conducted pilots with a couple of organisations to understand what would work well and how the seminars could be approached in different ways. Once they had a good understanding of what works well in practice, they conducted additional online seminars with individual firms and a group of firms (or the so called "open sprints" which bring firms together for the design sprints for AI readiness and the workshops on the future scenarios).

The project had a **communications and outreach strategy** to support engagement with firms with the project and increase understanding within the sector more generally, resulting in 45 engagement activities over the project's duration. This includes strategies to get companies involved in the workshops and design sprints, and for disseminating work more widely.

Table 21 Overview of project engagement activities

	Policymakers/ politicians	Industry/Business	Media (as a channel to the public)	Professional Practitioners
A formal working group, expert panel or dialogue	0	2	0	1
A magazine, newsletter or online publication	0	1	0	0
A talk or presentation	1	1	0	6
Engagement focused website, blog or social media channel	0	6	1	2
Participation in an activity, workshop or similar	3	15	0	6
Total	**4**	**25**	**1**	**15**

Source: NGS Research Fish Submissions

The fact that the project's research team is distributed across the UK has been both a challenge and provided new opportunities. As accounting and law are London centric industries, the project has found it more challenging and costly to deliver the early engagement of companies through informal meetings as they would often have to travel to London to meet in person, an important process to demonstrate commitment and engage with firms effectively. However, the geographical spread of the research team has allowed the project to engage with regional institutions and firms such as the ICA Scotland and local groups of business leaders in Manchester and Leeds.

As well as the design sprints, the project communicated its findings through academic papers, academic and practitioner conferences, as well as other events where project members have directly communicated results to firms and stakeholders. The table below provides an overview of the number of engagement activities.

To support continued dissemination of the work generated through the project and maintain momentum during the lockdown, the project launched a series of webinars. These webinars focus on sharing the learnings of the project, and the project team are leveraging their networks and engaging project participant firms as guest speakers. These webinars are publicised through the AI for Services Network and through the Manging Partner's Forum.

The project has produced a White Paper with recommendations for policymakers, regulators and sector bodies about interventions, systemic changes and forms of support that would enhance the uptake and use of AI technologies in PSFs, particularly for the delivery of high value services. The project aimed to engage with ~11 mid-market PSFs and ~30 policy advisors/civil servants from UK government departments (e.g., BEIS, DCMS, HMT). The participation of policy stakeholders centred on the closing event organised for the main project duration (prior to the uplift) involved policy stakeholders, including representatives of Cabinet Office, the Ministry of Justice. The event was organised as a workshop utilising one the design sprint developed during the project.

B.5.3.1   Project delivery

The project has completed after it received a non-costed extension to March 2021 but has continued as an uplift into 2022. The project has delivered the following outputs:

- A mapping report of the UK professional services sector landscape, identifying the stakeholders, intermediaries and representative bodies active in the sector.
- Report of AI technology adoption in mid-tier accountancy and law firms
- Report exploring the challenges facing mid-sized PSFs in implementing and adopting AI technologies using 2030 scenarios planning approach
- Next Generation Services White Paper with messages for both leadership teams and policy-makers
- Developed the Business Model Innovation & AI readiness Toolkit
- Developed the Collaborative AI Readiness: Design Toolkit from Professional Services Firms Toolkit
- Delivered a series of 9 webinars (all publicly available on the project's website)

- Delivered 16 multi-firm design sprints. The contribution of firms in design sprints equates to around £5,100 of in-kind contributions.[90]
- Project has expanded exposure of Ai application in the business environment to mid-market accounting and law firms

B.5.4   Programme effects

B.5.4.1   Effects of participation on the organisations supported

Participating in this project has helped team members become more acutely aware of the benefits of adopting AI. This new knowledge has encouraged them to think about ways in which AI can be applied within their organisations. As such, this new knowledge delivers practical benefits that can be applied in academia, and not just mid-tier businesses in accountancy and legal sectors. Furthermore, stakeholders from academia note that through the project they now have a better understanding of the challenges businesses face in the adoption of AI. Through this experience, future collaboration can emerge where businesses and academia continue to find ways of introducing AI.

The consortium has also engaged in conversations regarding commercial opportunities that might emerge from this project. One example is possible educational courses with paid participation. Oxford Brookes and Lancaster University have been exploring such courses with a planned date set for 2021 which had to be cancelled due to Covid. However, the team have continued working on this and are involving the Managing Partner Forum for the delivery of such courses. Another avenue of revenue generation includes a book release exploring the current uses of AI in accountancy and law firms in England. A second print of the book is now available and the project team is engaging in promotional activities for the release.

The project is also expected to benefit an industry that is highly important to the UK economy. The design sprints and the toolkits are designed to help participants understand their business models and encourage them to thinks about ways in which AI can be used to optimise service delivery. This is expected to bring wider benefits to companies within the industry by making their business models more resilient to changing environments and foreign competition.

"The tools and methods that the team developed are best in class and incredibly practical to apply. This research has inspired me to do more to collaborate with academia in business focussed research."

Legal tech incubator

It is expected that benefits will last long after the project's duration, although it is very challenging to monitor progress and prove that the project's outputs have influenced business thinking at the company level. Project members hope that with more funding and time, they will be able to sustain the momentum and explore the impacts of their work more actively in the future.

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90 In-kind contributions understood as the value of the time firms commit for employees to participate in workshops and design sprint activities and is valued at a flat rate of £600/hour.

> *"Being able to brief the law firms in our group on NextGenPSF, enable some to participate directly, and provide high quality resources (Project report, Book of approaches, Book of cases) has raised group awareness and understanding and given practical help to firms to move forward with related projects. We are also launching a group process improvement/design initiative at the request of member firms."*
>
> *Law firm*

Finally, the outputs from this project have attracted attention from policymakers and regulators, primary stakeholder groups involved in workshops and webinars. These engagements have helped to shape policy recommendations expected to make it easier for businesses to adopt AI technologies. Government departments have an interest in promoting artificial intelligence, but one common problem that often comes up in private-public sector engagement is the lack of a shared perspective. While this is not a sector-specific issue that the team has tried to address as part of this project, the conclusions of the research act as a clear reminder of the benefits from cross-departmental collaborations.

B.5.5   Sources

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B.5.6   Publications / outputs

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B.6 Unlocking the Potential of AI for English Law

B.6.1 *The project's environment*

When considering the implementation of such novel technologies as artificial intelligence (AI) in legal services, one must account for the dual aspect found within this industry. Namely that it touches upon both the economic aspect as well as societal aspects, being the fundamental groundwork for social order. As such, changes within the legal sector carry not only significant challenges but likewise high stakes as even missteps can have reverberating impacts.

However, if approached with the proper considerations, the introduction of AI presents significant opportunities for UK legal services. These considerations must account for the disruptive nature of such technologies as AI both from the perspective of changing business models (from the operational level to how human resources are managed) to the way practitioners engage with legal data.

The project "Unlocking the Potential of AI for English Law" explored the potential applications for AI in dispute resolution and AI methods to legal reasoning.

B.6.2 *Project profile*

B.6.2.1 Project overview

Grant Summary
The project: Unlocking the Potential of AI for English Law
Strand: Research Grant
ISCF NGS funding received: £ 1,322,274
Partner organisations: University of Oxford (Lead Research Organisation); UnitedLex; South Square; Avantia Law; Slaughter and May; Government of the UK; Cognitiv+; Allen & Overy LLP; British and Irish Legal Information Institute; Thomson Reuters; The Legal Education Foundation; Pitchbook Data; The Law Society of England and Wales; Ministry of Justice, United Kingdom; Thomson Reuters (not UK); Legal Education Foundation; Allen and Overy LLP; Law Society; LEXsnap.
Status of the project: Complete(Jan 19 – Dec 21)

The project aimed to explore the potential and limitations of using AI in support of legal services. In collaboration with industry partners, the multidisciplinary team from the University of Oxford investigated emerging business models for deploying AI in law. The analysis involved not only UK-based businesses but also drew on international comparisons between the UK and competitor countries (USA, Hong Kong, Singapore).

The project seeks to produce research into training and educational needs for lawyers' engagement with technology and programmers' engagement with law. The project team has developed educational and training packages which respond to the needs of both private-sector firms and universities. This has included contributions to the establishment of a new interdisciplinary Masters-level course for law and computing science, pilot modules for continued professional development of professional employees within the project's private sector partners.

B.6.2.2 The project participants

The principal investigator as well as co-investigators for the project are all affiliated with the University of Oxford and the research team was composed of experts from Oxford departments and faculties of Law, Economics, Computer Science, Education and the Said Business School.

The project received a partial extension for the funding to account for the impacts of COVID-19 on the project delivery (originally set for end of 2020). Specifically, it was agreed that activities most impacted by the pandemic (training delivery) would receive a costed extension while the project itself would receive a no cost extension until December 2021.

Additional investment for activities adjacent or stemming from the research results were secured through project funding of which £425,745 came from UK-based organisations, including EPSRC, UKRI, SRA across 4 applications between 2019-2021. These funds were applied to activities connected to the research findings emerging from the main project (i.e., additional reports to investigate finding emerging from the data) or to investigate future implementation of the training modules developed during the project. A further €1,496,131 was raised from European Research Council funding for the project "iManage - Rethinking Employment Law for a world of Algorithmic Management", helmed by one of the co-PIs. The project, with a duration between 2021-2026, examines the idea of algorithmic management - the process of automation replacing the upper management of organisations but not the workforce - and what could be the response from employment law.
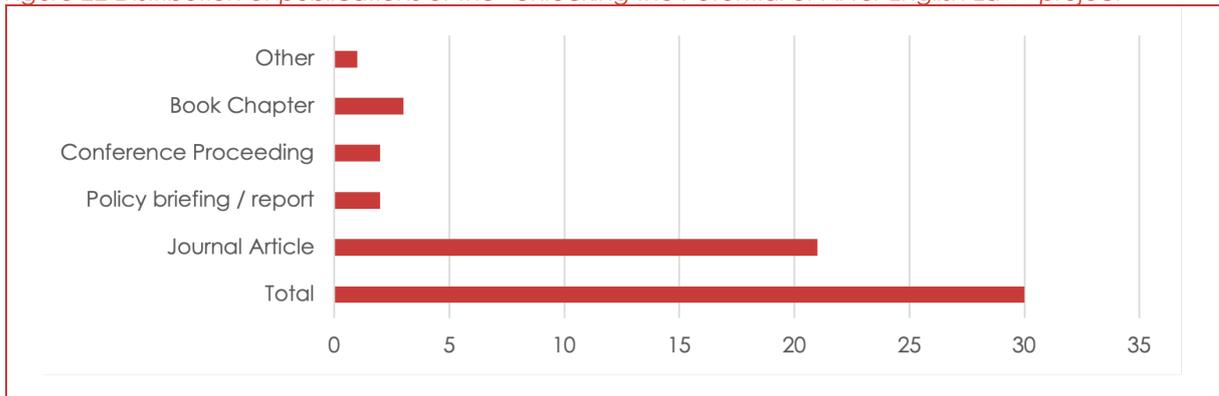
B.6.2.3 Project activities

The project investigated how AI could be applied in the provision of legal services, with a focus on businesses operating in the sector. The approach was described as a series of complementary questions which looked at the constrains of AI utilisation in the sector and opportunities for AI. Through this analysis overlaps would emerge presenting the overall landscape of AI in legal services. In total, the project was divided across six work packages (WPs):

- WP1 focused on identifying successful firm structures for AI - analysing how AI impacts the legal service business models and the changing needs for human resources working in legal services.

- WP2 was centred on supporting legal development by conducting research on emerging use of AI in dispute resolution.

- WP3 complemented WP2 by investigating how AI could be applied for legal reasoning

- WP4 analysed the skill requirements in a changing legal service landscape, what skill needs were emerging for working with technology. This included the launch of a Master's degree course by the Law Faculty and the Department of Computer Science at Oxford University.

- WP5 developed an understanding for the training needs of businesses operating in legal services by collaborating with private sector partners. This resulted in around 750 recipients of training within the private sector.

- WP6 was an analysis of lawtech ecosystem, including understanding the skills needs of start-ups working with lawtech, the success factors required for scale-up. The conducted research also led to the development of 2 databases: lawtech start-ups database which lists over 1000 lawtech start-ups; taxonomy of legal tech ventures which includes the development of an annotator to classify lawtech start-ups according to a taxonomy of legal tech ventures.

Their work examining the use of AI in legal services have resulted in 30 publications between 2019 and 2022.

Figure 22 Distribution of publications of the "Unlocking the Potential of AI for English Law" project

Source: NGS Research Fish Submissions

In total the project team presented 81 engagement activities of which the majority were aimed at professional practitioners working in the field of law. This is unsurprising given the reportedly important aspect of forming individual connections with people working in the industry rather than with organisations.

Table 22 Overview of project engagement activities

	Policymakers/politicians	Industry /Business	Media (as a channel to the public)	Professional Practitioners	Other audiences	Public/other audiences	Third sector organisations	Postgraduate students
A broadcast e.g. TV/radio/film/podcast (other than news/press)	0	0	0	1	0	0	0	0
A formal working group, expert panel or dialogue	4	6	0	15	3	0	1	0
A magazine, newsletter or online publication	0	0	0	2	0	0	0	0
A talk or presentation	2	2	0	10	1	0	0	1
Engagement focused website, blog or social media channel	0	0	0	2	2	0	0	0
Participation in an activity, workshop or similar	1	3	0	14	3	4	1	3
Total	**7**	**11**	**0**	**44**	**9**	**4**	**2**	**4**

Source: NGS Research Fish Submissions

One of the takeaways from the research was seeing how the legal services sector is evolving due to the changing skill demands - connected to a growing need for IT competences. This is forcing legal firms to take one of two broad pathways - focus on hiring, training interdisciplinary specialists (those with law and computer science skills) or focus on creating multidisciplinary teams (most likely hiring computer science experts to work with existing law specialists). Analysis

of business models and skill demands (in partnership with "Burning Glass") found that businesses in USA were more inclined to work with interdisciplinary specialists while UK businesses tend to opt for building interdisciplinary teams.

The analysis also revealed that businesses in legal services tended to face challenges coordinating interdisciplinary teams which typically functioned better in a corporate environment rather than in legal services which are characterised as partnerships. This demonstrated both a demand for new entrants to the labour market to possess both interdisciplinary skills and capacity to work in an interdisciplinary environment, while existing employees would benefit from training opportunities on working in interdisciplinary environment.

One of the ways these needs were addressed was through the launch of the course "Law and Computer Science" made jointly available to law and computer science students to foster interdisciplinarity. Practical work is organised in groups of six involving an equal mix of law and computer science students to foster skills required to work in an interdisciplinary team environment. Students also go through separate introductory seminars - computer science students learn law basics while law students learn computer science. Only after the introductory seminars students start working together. The course was launched in the 2020-2021 academic year and continues during 2021-2022 academic year. Student feedback helped shape the course content.

The experience developing the master's course was applied in the production of training material for practitioners. While initially envisioned for in-person delivery, COVID-19 forced the team to switch to online courses which begun in Q4 of 2020 with the summer of 2020 spent in cooperation with business partners (Slaughter and May) to tailor the course content to fit business needs. The courses themselves went through an iterative process with collected feedback used to adjust content, delivery for the following iteration. According to the PI, the courses were very well received, particularly the introduction to computer science which allowed law professionals to develop a background regarding use of emerging IT technologies. The training modules have been conducted with around 750 participants from the law service sector.

A second training programme was initially going to be developed in partnership with Allen & Overy. However, the contact with the business partner ended up switching jobs and moved into the Government legal department. This presented an opportunity to provide training material for people working in the government sector through what became the AI University programme aimed at training government employees about the application of AI in law.

More contribution to the legal system resulted from the work done on WP2 which looked into data accessibility and how AI could be used to support large scale data analysis of existing legal documents. The challenges that emerged regarding access to data helped demonstrate the existing constraints in the legal system. The work on WP2 resulted in the report "Building a Justice Data Infrastructure". Two members of the project team were invited to give a presentation to the UK Parliament Justice Committee. There were two other unplanned regulatory impacts: a report for Solicitors Regulation Authority (SRA) presenting how technology is deployed in legal services and; a report for the British and Irish Legal Information Institute (BAILII) about legal and ethical considerations related to access to legal data (still an ongoing development).

Beyond the interviews and surveys with people working in law business, the research team engaged in workshops, seminars, presentations, discussions, conferences etc. with policymakers (UK and international), representatives of trade associations, industry organisations and international organisations. In total, the project lists 76 engagement and

dissemination actions across 2019 and 2020. Of these, direct engagement with various stakeholders characterise the dissemination actions which workshop, conferences, seminars, etc, account for 29 dissemination actions while involvement in working group, expert panel, etc. account for 35.

The project held a closing conference on September 2021 where, through a series of webinars, the project results were presented and discussed. In terms of report outputs, the project currently lists 3 deliverables of which the latest is the white paper "AI-assisted lawtech: its impact on law firms". This was published in December 2021 and discusses the future uptake and impact of AI within the UK legal service sector. However, some of the project outputs continue to be worked on. As mentioned before, the team continues to work on a report for BAILLI concerning accessibility of legal data including discussing the legal and ethical aspects of this.

Another ongoing effort relates to a start-up - in 2019 the project launched Serein.AI - a spin out company which is meant to focus on creating machine-learning systems working with high-volume or routine legal documents. The company is a joint venture between one of the project partners (Avantia Law) and University of Oxford represented by one of the co-investigators. Serein.AI combines the understanding of business models and using AI in law with the conducted analysis and mapping of lawtech ecosystem. Currently (Q1 of 2022) the start-up is undergoing changes since one of the initial founders has left, with plans to relaunch Serein.AI later in 2022.

Furthermore, the project team is exploring continuation of training modules, either through a new business venture focused on the delivery of training or becoming part of the Faculty of Law at Oxford University (faculty of computer science is ready to contribute but the effort would be led by the Faculty of Law).

B.6.3   Programme effects

B.6.3.1   The role of the NGS programme

According to the project PI, before the start of the project there was already interest in examining how emerging technologies were impacting the legal systema and businesses operating there. Specifically, a multidisciplinary team was set up in 2017 which began analysing what was described as "mechanisation of law" and analysing the impacts of the fourth industrial revolution on law.

The launch of the ISCF NGS programme coincided with these research interest and the team quickly pivoted to take advantage of the programme.

B.6.3.2   Effects of participation on the organisations supported

The project helped demonstrate the education and training needs within the law sector, not only related to preparing graduates to enter the labour market with new skills but also developing skills of existing labour force. Particularly, it highlighted the need for training across all levels of organisations. This led to a consideration that future relationships between universities may need to shift towards lifelong education for continued skill renewal.

Furthermore, the exploration of how AI can be introduced into law firms led to considerations about changing organisation models, particularly the emerging need for greater interdisciplinarity within businesses in the sector.

In relation to evolving roles of universities, the interdisciplinary nature of skills explored during the project led to internal discussions about how the Faculty of Law could leverage opportunities towards greater interdisciplinarity. This has led to year-long internal research, concluding in a set of recommendations which, according to the PI, have been approved by the faculty. The planned changes will result in new job openings within the faculty (roughly four times the current number of planned positions) to facilitate interdisciplinary research and education.

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Appendix C   Research project outputs

Table 23 Research Projects: Engagement types

Engagement type	Innovating Next Generation Services through Collaborative Design (NextGenPSF)	Technology Driven Change and Next Generation Insurance Value Chains (TECHNGI)	Unlocking the Potential of AI for English Law	Total
A broadcast e.g., TV/radio/film/podcast (other than news/press)		3	1	4
A formal working group, expert panel or dialogue	3	26	29	58
A magazine, newsletter or online publication	1	3	2	6
A press release, press conference or response to a media enquiry/interview		1		1
A talk or presentation	8	11	16	35
Engagement focused website, blog or social media channel	9	5	4	18
Participation in an activity, workshop or similar	24	24	29	77
Total	45	73	81	199

Source: Research Project Researchfish submissions, 2022

Table 24 Research Projects: Publications by type and research project

Publication types	Number of outputs
Innovating Next Generation Services through Collaborative Design	**13**
Book	2
Journal Article	4
Manual / Guide	1
Policy briefing report	4
Conference Proceeding Abstract	2
Technology Driven Change and Next Generation Insurance Value Chains (TECHNGI)	**44**
Book	1
Journal Article	15
Conference Proceeding Abstract	3
Book Chapter	4
Other	13
Technical Report	1

Working Paper	5
Consultancy Report	2
Unlocking the Potential of AI for English Law	**30**
Journal Article	21
Policy briefing report	2
Conference Proceeding Abstract	2
Book Chapter	3
Other	1
Technical Report	1

Source: Research Project Researchfish submissions, 2022

Appendix D   Consultation response rates

D.1   CATI survey - Successful and unsuccessful applicants

A list of 232 respondents (71 participants and 161 unsuccessful applicants) were approached for a telephone survey at different times of the day and on different days of the week between 28/04/2022 and 28/06/2022. To increase the response rate, a link to an online version of the same survey was shared with non-respondents two weeks before the survey closed.

The survey response rate is 48% (34 respondents out of 71) for participants and 30% (48 respondents out of 161) for unsuccessful applicants. Successful non-responders were called up to 17 times over this period to try and secure an interview or encourage completion online. One respondent completed the survey online through an open link upon request, and one respondent completed it online after an email was sent to all non-responders. All others completed the survey by telephone.

Table 25 Data sources: CATI survey: sample populations and response rates

	Population	Survey sample	Survey response rate
Participants	71	34	48%
Unsuccessful applicants	161	48	30%
Total	232	82	35%

For the participant group, 5 contacts did not have a valid telephone number and 18 more contacts had a valid telephone number but did not respond to either telephone calls or emails. The two cases under "outside criteria" were because one company had dissolved, and one academic had retired. The 5 refusals for the participant group were either due to being 'too busy' to take part or because they did not sufficiently recall the application.

Table 26 Data sources: CATI survey: call outcomes

	Participants	Unsuccessful applicants	Total
Completed the survey	34	48	82
Call back/soft appointment	1	3	4
Didn't complete online survey after asking for a link to be resent	6	10	16
Answer machine / No reply	18	48	66
Deadline / out of order / disconnected / wrong number	5	24	29
Outside criteria / not applicable	2	1	3
Refused	5	27	32
Total	71	161	232

The breakdown of the CATI survey respondents across stakeholder groups closely mimics the wider programme population, although the share of survey respondents from large businesses is slightly smaller and that of academic/research is slightly higher. In terms of the position in the

supply chain, end-user organisations have a higher representation than technology providers for the participants group, and a relatively balanced representation for unsuccessful applicants.

Table 27 Data sources: CATI survey respondent profile, organisation size

Stakeholder group	Programme		Final survey (n)		Final survey (%)	
	Successful	Unsuccessful	Successful	Unsuccessful	Successful	Unsuccessful
Large	15%	14%	2	4	6%	8%
Medium	3%	3%	0	0	0%	0%
Small or micro	57%	61%	19	33	56%	69%
Academic / Research	22%	19%	9	6	26%	13%
Other / unknow	3%	3%	4	5	12%	10%

Table 28 Data sources: CATI survey respondent profile, position in supply chain

Supply chain	Final survey (n)		Final Survey (%)	
	Successful	Unsuccessful	Successful	Unsuccessful
End-user	24	26	71%	54%
Technology provider	10	22	29%	46%

D.2   Research Project participant survey

For the final evaluation it became apparent that there were a breadth of benefits and impacts for the participants in the research projects that may not have been captured through other data collection activities.

To address this, a short online survey was designed following an initial interview with research project PIs. This survey was distributed by the PIs of the research projects through their respective networks to the stakeholders with whom they had contact. The survey was designed with the intention of capturing feedback from the breadth of participant types and benefits types.

The survey was launched in mid-May and closed on July 20th, 2022. The survey was distributed by the PIs of the research projects through their respective networks to the stakeholders with whom they had contact and influence.

In total, the survey received 21 usable responses. Almost all participants reported participating in only one of the Research Projects, except one business (a law firm) who had participated in both Unlocking the Potential for AI in English Law and NextGenPSF.

Table 29 Data sources: Research Project participant survey respondents: per research project

Research Project	Number of participating survey respondents

Innovating Next Generation Services through Collaborative Design (NextGenPSF)	11
Unlocking the Potential for AI in English Law	6
Technology Driven Change and Next Generation Insurance Value Chains (TECHNGI)	4

Table 30 Data sources: Research Project participant survey respondents: by stakeholder type

Stakeholder type	n	%
AI/data firm (Technology provider / software development)	5	24%
Law firm / legal services (including in-house legal departments)	6	29%
Insurance services	2	10%
Sector organisation (including network support organisation)	2	10%
Research / academia	5	24%
Accountancy services (including in-house accounting departments)	1	5%

D.3   AI for Services survey

The AI for Services network currently has a mailing list to which around 1,400 people have joined. At the interim stage, the survey was distributed to over 1,300 contacts, giving the survey as response rate of ~1.5%. Though this was in line with the response rate of other surveys of network communities run by the KTN, we also sought to increase the number of responses for the final evaluation.

For the final evaluation, we secured 27 responses. This was achieved through emailing the survey to the network's mailing list and inviting them to participate in a short online discussion.

The final evaluation also sought to align it activities with the consultation activities employed to undertake the AI for Services Report 2022 however this was not possible.

Table 31 Data sources: AI for Service network participants, applicants to ISCF NGS

Could you please confirm for us if you submitted a proposal for a grant from the ISCF Next Generation Services programme? (n=27)	Amount	Percentage
Yes, I submitted a grant proposal	8	30%
No, I did not submit a grant proposal	19	70%

Source: Technopolis, 2022 survey of the AI for Services network (n=27)

Table 32 Data sources: AI for Services network, successful / unsuccessful applicants to ISCF NGS

Are you / were you a participant in the NGS programme (i.e., were any of your applications to NGS successful)? (n=8)	Amount	Percentage
Yes, I am participant in the programme	7	88%

No, my application/s to NGS was/were not successful	1	13%

Table 33 Data sources: The main sector activity for AI for Services survey respondents

Stakeholder type	n	%
AI/data firm (Technology provider / software development)	12	48%
Public sector / government	4	16%
Research / academia	4	16%
Accountancy services firm	2	8%
Sector organisation	1	4%
Other (please specify)	2	8%
Insurance services firm	0	0%
Regulator / Standards Body	0	0%

D.4 Project competition forms

Table 34 Data sources: PCF respondent profile per strand and role in project

Row Labels	Number of PCFs	Number of participants	% of participants	Strand	Number of projects with at least one PCF form	% of projects	Number of PCF responses	% of participants submitted PCF responses
Academic	14	17	82%	CR&D Large Strand	4	100%	11	69%
Collaborator	14	40	35%	CR&D Small Strand	30	100%	43	80%
Lead	38	38	100%	Data Access CR&D	4	100%	12	48%
Total	66	95	69%	Total	38		66	69%

D.5 Interviewees

Table 35 Data sources: Interviewees

Strand	Grant Title	Organisation	Contact name

CR&D Large Strand	Automation and Transparency across Financial and Legal services: Mitigating Risk, Enhancing Efficiency and Promoting Customer Retention through Customer Retention through the Application of Voice and Emotional AI	Intelligent Voice Ltd	Nigel Cannings
CR&D Large Strand	Automation and Transparency across Financial and Legal services: Mitigating Risk, Enhancing Efficiency and Promoting Customer Retention through Customer Retention through the Application of Voice and Emotional AI	University of East London	Julie Wall
CR&D Small Strand	SmartPolicy	Kennedys law LLP	Karim Derrick
CR&D Small Strand	Development and commercialisation of an AI, ML and data enabled online commodity trade finance platform (Athena)	Satoshi Systems Limited	Saurabh Goyal, Martina Stieger
CR&D Small Strand	Development and commercialisation of an AI, ML and data enabled online commodity trade finance platform (Athena)	Chrysalis Analytics Ltd	Miranda Chong
CR&D Small Strand	To investigate the use of AI techniques to augment the role of legal professionals during negotiation	Transparently Ltd	Becki Cassia, Steve Stewart
CR&D Small Strand	KnowRisk SC - Fusing data from Industry, Accounting, Insurance and Law to better identify, monitor and manage risk across entire supply chains	Sweetbridge Emea	Scott Nelson and Alan Chute,
CR&D Small Strand	KnowRisk SC - Fusing data from Industry, Accounting, Insurance and Law to better identify, monitor and manage risk across entire supply chains	Digital Catapult	Yogesh Valdyanathan and Hassan Mahmud
Data Access CR&D	Standard for Environment, Risk and Insurance (SERI)	Brit Ltd	James Birch
Research Project	Technology Driven Change and Next Generation Insurance Value Chains (TECHNGI)	Loughborough University	Professor Alistair Milne and Professor Chris Holland
Research Project	Innovating Next Generation Services through Collaborative Design	Oxford Brookes University	Professor Tim Vorley
Research Project	Unlocking the Potential of AI for English Law	University of Oxford Faculty of Law	Professor John Armour

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