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Innovation Centre Programme Evaluation

Final Report

Appendix G SAIC

ADDITIONAL RESEARCH

March 2023

Table of Contents.

TABLE OF CONTENTS.	ii
APPENDIX G. SAIC (SUSTAINABLE AQUACULTURE INNOVATION CENTRE).	1
1 INTRODUCTION	1
2 DEVELOPMENT AND APPROACH.	1
2.1 MAIN ELEMENTS OF PHASE 1 PROPOSAL.	1
2.2 MAIN FINDINGS FROM PHASE 1 DUE DILIGENCE.	1
2.3 MAIN ELEMENTS OF PHASE 2 BUSINESS PLAN.	2
2.4 EVALUATION LOGIC MODEL.....	3
3 MARKET FAILURE AND STRATEGIC FIT	4
3.1 MARKET FAILURE RATIONALE.....	4
3.2 STRATEGIC FIT.	5
3.3 COVID RESPONSE.....	6
4 INPUTS, ACTIVITIES AND OUTPUTS.	6
4.1 FUNDER INPUTS.	6
4.2 ACTIVITIES AND OUTPUTS.	6
5 OUTCOMES AND IMPACTS.	9
5.1 MAIN FINDINGS FROM MEF.	9
5.2 MAIN FINDINGS FROM SURVEY OF BENEFICIARIES.....	10
5.3 ASSESSMENT OF INNOVATION ECOSYSTEM BENEFITS.....	13
6 DELIVERY AND VALUE FOR MONEY.	20
6.1 GOVERNANCE AND OPERATIONAL ARRANGEMENTS.	20
6.2 MONITORING AND EVALUATION.....	21
6.3 VALUE FOR MONEY.	22
7 PROGRESS AGAINST TARGETS AND OBJECTIVES	24
7.1 TARGETS.....	24
7.2 OBJECTIVES.	25
8 IMPACT CASE STUDIES.	26
8.1 INTRODUCTION.	26
8.2 CASE 1. MOWI SCOTLAND.....	26
8.3 CASE 2. PULCEA.....	31
8.4 CASE 3. MOREDUN RESEARCH INSTITUTE.	33
9 CONCLUSION	35

LIST OF APPENDIX FIGURES

FIGURE A. 1 SAIC PHASE 2 LOGIC MODEL..... 3
 FIGURE A. 2 SAIC INNOVATION ECOSYSTEM BENEFITS.....14

LIST OF APPENDIX TABLES

TABLE A. 1 SAIC INPUTS TO MARCH 2023..... 6
 TABLE A. 2 SAIC: NUMBER OF ENTRANTS TO EDUCATION/TRAINING..... 7
 TABLE A. 3 SAIC: NUMBER OF INDIVIDUALS GAINING NEW QUALIFICATIONS/SKILLS..... 7
 TABLE A. 4 SAIC: NUMBER OF ENGAGEMENT EVENTS LED OR DELIVERED BY IC..... 7
 TABLE A. 5 SAIC: FOLLOW ON FROM COMPLETED COLLABORATIVE PROJECTS..... 8
 TABLE A. 6 SAIC: COLLABORATIVE PROJECTS..... 8
 TABLE A. 7 SAIC: NUMBER OF IC COLLABORATIVE PROJECTS LEADING TO INTENTION TO COMMERCIAL LAUNCH/APPLICATION..... 9
 TABLE A. 8 SAIC: ANTICIPATED JOBS SUPPORTED/CREATED.....10
 TABLE A. 9 SAIC: ANTICIPATED TURNOVER SUPPORTED/CREATED.....10
 TABLE A. 10 SAIC: POSTS CREATED IN SCOTTISH HEIs/COLLEGES/PUBLIC SECTOR.....10
 TABLE A. 11 SAIC BUDGET EXECUTION.....22
 TABLE A. 12 FINANCE MOBILISED, SAIC, TO JUN 2021/22.....23
 TABLE A. 13 COST PER JOB, SAIC.....23
 TABLE A. 14 GVA RATIO, SAIC.....23
 TABLE A. 15 SAIC, PROGRESS AGAINST TARGETS.....24
 TABLE A. 16 SAIC ACHIEVEMENTS AGAINST OBJECTIVES.....25

Appendix G. SAIC (Sustainable Aquaculture Innovation Centre).

1 Introduction.

Launched in June 2014, and hosted by the University of Stirling, the Sustainable Aquaculture Innovation Centre (SAIC)¹ works to reduce the environmental footprint and increase the economic impact of aquaculture. In line with other ICs, the centre seeks to connect businesses and academics, fund and support commercially relevant, collaborative research, and also fund university places and run tailored training programmes. SAIC's priority areas include: fish health and welfare, unlocking sector capacity, shellfish and other species, and environmental impact.

2 Development and approach.

2.1 Main elements of Phase 1 proposal.

Phase 1 ran over five years to 31 July 2019 (with an option to extend to 31 December). In Phase 1, SAIC established itself in the Scottish aquaculture industry ecosystem as a connecting point between industry, academia and public-sector stakeholders. During this period, SAIC created a strong network with a national consortium of 102 members drawn from all parts of the sector, and utilised the network to instigate large-scale projects to tackle key challenges identified by the industry including the prevalence of sea-lice and gill health disease. It is noted SAIC made the decision to develop fewer large projects with many collaborators instead of many small projects².

An important dimension of the work of SAIC is the rural context of the sector. Fish farms in Scotland are located almost exclusively in rural locations, primarily on the west coast of Scotland and Northern Isles and job creation in these regions is vital to ensuring the sustainability of rural life, creating high quality jobs that allow talent to be retained and brought into the region and for investments to be made in rural areas.

Priority innovation areas (PIAs) in Phase 1 include³:

- PIA 1: Address environmental and health challenges, particularly sea lice and gill disease.
- PIA 2: Develop feeds that optimise fish health and nutrition.
- PIA 3: Unlock additional capacity for aquaculture development through innovative, evidence-based approaches.
- PIA 4: Establish a reliable supply of mussel spat (baby mussels).

2.2 Main findings from Phase 1 due diligence.

Reflections on Phase 1 by funders noted that the activities had changed over time with SAIC's evolving understanding of the sector's needs, the most effective approaches, the barrier to participation, and the most significant research challenges. The high industry leverage in year one was considered reflective of the pent-up demand for support⁴.

Some key reflections on Phase 1 included⁵:

¹ The centre rebranded from the Scottish Aquaculture Innovation Centre in 2021.

² SFC (2019) Innovation Centre programme, phase 2 approval paper, FC/19/43, June, SFC: Edinburgh.

³ SAIC (2016) Operating plan 2016-2019, SAIC: Stirling.

⁴ HIE (2019) SAIC appraisal paper, project ID: 9369403, HIE: Inverness, p4.

⁵ HIE (2019) Phase 2 Appraisal, HIE: Inverness.

- SAIC has established itself in the Scottish aquaculture industry eco-system as a connecting point between industry, academia and public-sector stakeholders and with a strong network.
- SAIC's activities changed over time reflecting SAIC's evolving understanding of the sector's needs, the most effective approaches, the barrier to participation, and the most significant research challenges. The high industry leverage in year one was considered reflective of a pent-up demand for support.
- Running through proposed activities should be a priority to extend the reach and benefits of SAIC further into the SME base, especially in the HIE region, although activities in remote areas will always remain a challenge, with most larger companies and research institutions headquartered in the Central Belt.
- A need for building on the high quality work of the team by expanding headcount while retaining in-depth sector knowledge and expertise.

The following main impacts from Phase 1 were anticipated at the time of Phase 2 approval in 2019:

- Jobs created/protected (FTE): 204.
- Jobs in the rural economy (FTE): 170.
- GVA created: £48.2 million.
- Additional research income: £27 million.
- ROI on funding: £1: £4.34.

2.3 Main elements of Phase 2 business plan.

In Phase 2 (2019-24) SAIC identified three workstreams:

1. Driving Innovation.
2. Sharing Innovation.
3. Nurturing Innovation.

These three strands represent a shift in focus, with key beneficiaries identified as SMEs and the wider aquaculture supply chain. Phase 1 focussed to a greater degree on larger aquaculture producers. It is intended that this change will bring benefit to a greater number and range of companies ensuring that the benefits of innovation are as inclusive as possible and maximising local opportunities as well as development of international markets. SAICs activities are focused on three PIAs:

- PIA 1 Finfish health and welfare.
- PIA 2 Unlocking additional capacity.
- PIA 3 Shellfish and other non-finish species.

Key stated activities in Phase 2 include the delivery of 15 multi-party collaborative innovation projects, growth to 130 consortium members, nine submitted applications to leverage funding into Scotland, £3.5 million of additional project revenue leveraged to support innovation projects, 125 students gaining an MSc qualification and four students gaining a PhD qualification.

Forecast impacts for Phase 2 were⁶:

- Jobs created/protected (FTE): 220.
- Jobs in the rural economy (FTE): 100.
- GVA created: £24.3 million.
- ROI on funding: £1:£2.43.

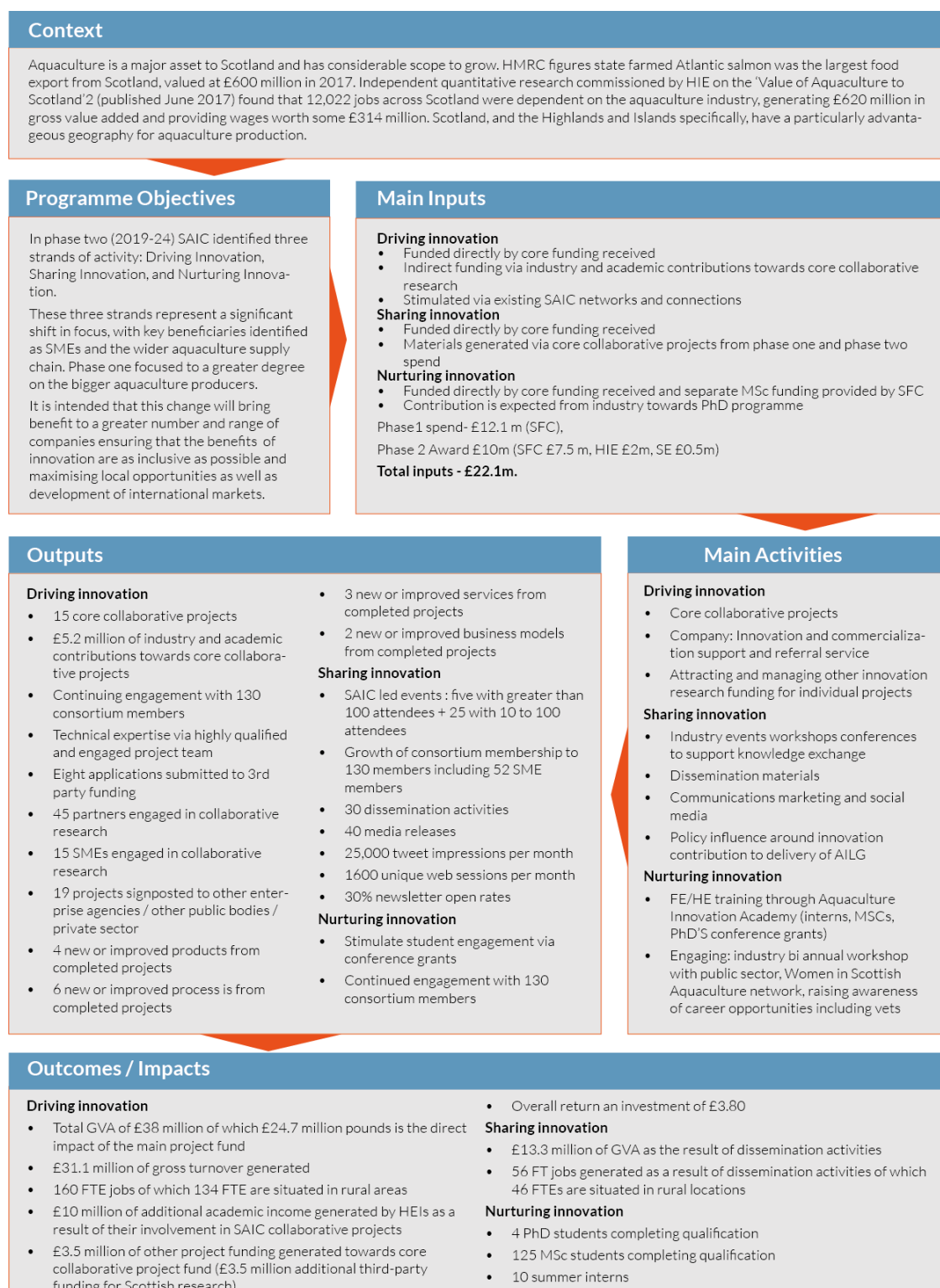
With direct funding from HIE, this phase underlined both the importance of aquaculture to the HIE region as well as the confidence from HIE that SAIC would generate significant impact in Phase 2.

⁶ SFC (2019) Innovation Centre programme, phase 2 approval paper, FC/19/43, June, SFC: Edinburgh, p3.

2.4 Evaluation Logic model.

The Phase 2 approach of SAIC is summarised in the figure below (see Figure A. 1). The basis for this model, is the SAIC Phase 2 appraisal, adapted by the authors to conform with a consistent logic model terminology. Note output, outcome and impact figures relate to business plan and not MEF actuals.

Figure A. 1 SAIC Phase 2 logic model.



Source: Adapted from HIE (2019) Scottish Aquaculture Innovation Centre Phase 2 - combined stage 2 & 3 appraisal.p21. SAIC also note additional funding from SFC of £542k to date for Phase 2.

3 Market failure and strategic fit.

3.1 Market failure rationale.

The market failure rationale for SAIC was elaborated in Phase 2 funding application along four main dimensions⁷:

- **Risk aversion** - investment in innovation, research and development has substantial risk (especially true for SME businesses). SAIC can address this by providing part-funding that will reduce financial risk.
- **Complexity and cost** - innovation challenges are extensive and cut across companies and the supply chain. The costs of addressing these issues are substantial and SAIC assumes that no company based in Scotland has the resources to address them individually.
- **Lack of knowledge** - the industry suffers from a range of weaknesses in information including knowledge of existing techniques operated elsewhere, knowledge of expertise in research institutions, and (particularly for supply chain companies) a lack of information on the opportunities.
- **Skills gap** - the sector is experiencing skill shortages amongst key technical staff as well as skills gaps.

As such, SAIC activities may be justified in terms of several aspects of market failure as set out in the main report. These include the *efficiency* considerations of *information failure* (in this case developing the conditions for wider identification and adoption of good practice in the aquaculture sector) as well as the *positive externalities* associated with new products, services and processes that deliver environmental benefits.

The relevance of wider intervention drivers is also clearly evident in the objectives of SAIC including those of *coordination failure* (in fostering links between academia, industry, the public sector and citizens), as well as *opportunity* (in priming the aquaculture sector, especially SMEs and the supply chain, to exploit commercial opportunities especially in export markets). In addition, there is a strong equity dimension to the work of SAIC in supporting an industry that has an important footprint, and role in sustaining, rural areas.

A survey of SAIC clients emphasises several particular factors were considered significant in constraining their establishment's innovation activities before working with SAIC (these were broadly consistent with IC clients as a whole). '**Availability of finance**, including awareness of funding opportunities' was the most frequently cited constraint on establishment's innovation activities before working with SAIC (32%), followed by '**lack of access to academic expertise** or other partnership opportunities' (22%). In this regard, 'information failure' is supported as a significant market failure.

It is noted that some 27% of respondents did not cite any of the commonly cited barriers prior to working with SAIC, suggesting that, across the programme period, some common types of market failure rationale, particularly related to information failure, were not a particularly strong factor for a significant proportion of clients.

More generally, one board member noted the importance of a strategic shift in SAIC's approach, with a focus on "big salmon producers at first", to include greater SME representation, now "hugely improved" in recognition that is "harder for smaller players" [76]. However, another stakeholder highlighted the importance of getting "big industry on-side early" as a partner in the innovation ecosystem [73]. In addition, without the support provided by an organisation such as SAIC, it was considered that some individual companies may engage with universities, or undertake proprietary research, but that a lot of sharing would be lost within the wider sector [35, 73], and the current approach benefits smaller collaboration partners in the supply chain.

⁷ SAIC business plan cited in HIE (2019) Scottish Aquaculture Innovation Centre Phase 2 - combined stage 2 & 3 appraisal.p9.

3.2 Strategic fit.

The Centre has a particularly strong fit with the Scottish Government's blue economy vision for Scotland⁸, as commented by a senior Marine Scotland stakeholder [73]. SAIC's business plan sets out the strategic fit and contribution of their work⁹, notably, the relevance to supporting:

- Highlands and Islands Enterprise (HIE): for example, developing regional comparative advantage, and local opportunities, in the marine economy through collaboration between industry and academia.
- Scottish Funding Council (SFC): for example, generating greater industry relevant innovation, transforming academic expertise into benefit for the wider economy, and delivering high-quality learning and teaching through its MSc, PhD and other skills programmes.
- Scottish Enterprise (SE): for example, building resilience, growth, and international advantage for businesses and key sectors, and
- Scottish Government: for example, making Scotland wealthier and fairer through the generation of jobs and wealth, particularly in rural areas.
- Marine Scotland: for example, enabling the realisation of the Farmed Fish Health Framework (FFHF) ambitions.
- Stirling and Clackmannanshire City Deal: for example, supporting the work of the University of Stirling's Institute of Aquaculture (IoA).

More generally, a SAIC board member cited the importance of the body in creating linkages between science and industry in the aquaculture sector that was hitherto lacking [76]. Another, that SAIC had been successful in finding the right balance between academic and industry collaboration, and that "industry was very much driving it" with a focus on applied research relating to three priority industry areas (PIAs¹⁰) (reduced from four)[35, 36], and that the organisation had played "a fantastic role in getting people together for the industry".

Another senior Marine Scotland official commented that SAIC "understands the space where it adds value- the applied space". Further, an academic board member commented that SAIC fitted "a perfect niche" by providing a less time-consuming route for research of an applied nature in comparison with larger 'research council' grant applications [56].

These individuals also noted that, during the course of Phase 2 SAIC was engaged with a wider variety of stakeholders, including regulators. Nonetheless, there was a desire by one SE stakeholder for further emphasis on supply chain engagement, commenting "they would like to see more" and for this to "expand in the future". A growing engagement with SMEs was also commented on by a number of stakeholders [e.g., 30, 36].

The on-going strategic relevance of the centre's work is demonstrated by close working with a range of stakeholders, through participation and support of relevant sector steering groups and trade bodies, for example, City and Regional Growth Deals, Marine Scotland, SEPA, Life Sciences Scotland Industry Leadership Group (LSSILG), Farm Fish health Framework (FFHF), Blue Economy Cluster Builder (BECB), Salmon Scotland Technical Meetings, British Trout Association (BTA), Association of Scottish Shellfish Growers (ASSG), Scottish Seaweed Industry Association (SSIA), and Insect Industry UK (IIUK), etc.)¹¹.

SAIC has also supported the University of Stirling's Institute of Aquaculture (IoA) in the establishment of The National Aquaculture Technology and Innovation Hub (NATIH) which aims to be a pioneering innovation centre set-up to drive the UK's ambitions to become a world leader in modern aquaculture practice. The hub will deliver new, state-of-the-art laboratories and aquatic experimental

⁸ Scottish Government (2022) A blue economy vision for Scotland, Scottish Government: Edinburgh.

⁹ SAIC business plan cited in HIE (2019) Scottish Aquaculture Innovation Centre Phase 2 - combined stage 2 & 3 appraisal.p6.

¹⁰ Projects must align with PIAs.

¹¹ SAIC (2022) Delivery Plan, FY 2022-23, SAIC: Stirling, p.5.

facilities. NATIH, is due to open in 2024, and is a £17 million investment by the Stirling and Clackmannanshire City Region Deal¹². While very welcome overall, stakeholders expressed some concerns about potential duplication of effort between SAIC and the IoA and that the industry-led focus of the former should be not become overshadowed [30, 36, 73].

One strategic area of focus where further potential SAIC activity was highlighted by a board member was in further examining the socio-economic aspects of aquaculture (e.g., housing issues within the sector) [36], which would align strongly with the blue economy vision for Scotland noted above.

3.3 Covid response.

In line with all ICs, SAIC experienced a challenging operating environment during the period 2020-22 as a consequence of the Covid-19 pandemic. In response, SAIC consulted with industry and academic partners on how best they could support them in recovery, concluding¹³:

- SAIC’s three PIAs were considered to remain the best focus in terms of supporting industry needs, as are their themes of driving, sharing and nurturing innovation.
- SAIC rebranded as the Sustainable Aquaculture Innovation Centre, reflecting the current climate crisis and their strategic alignment with the green recovery priorities shared by Scottish and UK governments and the wider community.
- SAIC proposed to step up co-activity with other ICs and clusters, creating synergies that will attract external funding, fuel recovery and growth, and support achievement of Net Zero targets.

4 Inputs, activities and outputs.

4.1 Funder inputs.

SAIC funder inputs are noted below. SFC Phase 1 spend totalled some £12.8 million (£11.1 million in core funding and £1,709,000 in capital costs). The Phase 2 Business Plan requested a total of £13.5 million in public funding. The funding partners identified a budget of up to £10 million with £3.5 million of additional project funding to be leveraged from other sources. Phase 2 awards total £10 million (SFC £7.5 million, HIE £2.0 million, SE £0.5 million), with £7.2 million actual spend to date. This relates to funders only and does not reflect any other leveraged funding and assumes all funder contributions by purpose (i.e., core funding or project related).

Table A. 1 SAIC inputs to March 2023.

	Phase 1 Spend	Phase 2 Award	Phase 2 Actual to Date	Total Spend to Date
SFC	£12.8 million	£7.5 million	£5.7 million	£18.5 million
HIE	-	£2.0 million	£1.2m	£1.2 million
SE	-	£0.5 million	£0.3m	£0.3 million
Total	£12.8 million	£10.0 million	£7.2 million	£20.0 million

Source: SFC, SE, HIE correspondence ('Summary funders awards and drawdowns to date', excel spreadsheet, Feb 2023).

4.2 Activities and outputs.

Skills

Education and training activity is primarily focused on MSc support, with 141 entrants to date (see Table A. 2). A substantial number of MSc students gained new qualifications during Phase 1 (87), with a further 43 gaining a master’s during Phase 2 to date (Table A. 3). Other skills activities are not

¹² <https://www.stir.ac.uk/about/faculties/natural-sciences/aquaculture/national-aquaculture-technology-and-innovation-hub/>

¹³ SAIC (2021) SAIC response to SF: fueling Scotland’s green recovery in the emergency years, SAIC: Stirling.

recorded in the MEF and are commented on further below. For example, SAIC has delivered number of innovation, leadership and mentoring programmes, supporting 215 trainees through non-accredited programmes, developed by SAIC to meet the needs of Scotland's aquaculture sector.

Table A. 2 SAIC: number of entrants to education/training.

Level	Phase 1	Phase 2	Total
PhD/EngD	4	5	9
MSc	86	55	141
HND/HNC	0	0	0
Other	0	0	0
Total	90	60	150

Source: MEF

Table A. 3 SAIC: number of individuals gaining new qualifications/skills.

Level	Phase 1	Phase 2	Total
PhD/EngD	0	0	0
MSc	87	43	130
HNC/HND	0	0	0
Other	0	0	0
Total	87	43	130

Source: MEF(phase 1 to Jul 2019, phase 2 Jul 2019 to Jul 2022).

Networking and ecosystem linkages

The extensive networking element of the SAIC delivery plan is evidenced by a high volume of engagement events led or delivered and continuing through Phase 1 and Phase 2 (see Table A. 4). Phase 1 also saw a high level of follow on activity for completed projects. In contrast, given the low number of completed projects, follow-on from completed collaborative projects is low to date in Phase 2, as reported in the MEF (see Table A. 5).

It is also noted that as at the date of the MEF reviewed (July 2022), nine (of 46) Phase 1 projects and 41 (of 46) Phase 2 projects had yet to complete, so all outputs on commercialisation had still to be reported. In particular it is noted that SAIC further record 113 signposting activities that they have completed (as reported in their annual report covering the period to 31 July 2022) which are not included in this section of the MEF as they do not relate to a completed SAIC project, and which signify a wider signposting body of activity.

Table A. 4 SAIC: number of engagement events led or delivered by IC.

Level	Phase 1	Phase 2	Total
> 100 Attendees	47	9	56
10-100 Attendees	106	47	153
< 10 Attendees	0	0	0
Total	153	56	209

Source: MEF

Table A. 5 SAIC: follow on from completed collaborative projects.

Level	Phase 1	Phase 2	Total
Signposted to SE	0	0	0
Signposted to HIE	1	0	1
Signposted to other public funding/support body	8	1	9
Signposted to private sector	9	1	10
IC supported follow-on project planned or underway	8	1	9
Direct to market (by a business in Scotland)	2	1	3
Projects not taken forward	2	2	4
Total	30	6	36

Source: MEF (phase 1 to Jul 2019, phase 2 Jul 2019 to Jul 2022).

Collaborative projects

SAIC's collaborative project work is recorded in Table A. 6, reflecting the logic model of the IC. The multi-year nature of many projects is reflected in the relatively low number of completed collaborative projects in Phase 2 (although a further 14 in the pipeline).

Table A. 6 SAIC: collaborative projects.

Level	Phase 1		Phase 2	
	No. of collaborative projects (including completed)	No. of new collaborative projects	No. of continuing collaborative projects	No. of completed collaborative projects
Academic/IC to business (involving at least 1 business in Scotland)	30	20	18	2
Academic/IC to business (involving no businesses in Scotland)	0	0	0	0
Academic / IC to Academic	-	0	0	0
Business to business (involving at least 1 business in Scotland)	0	0	0	0
Academic/IC to public sector (involving no businesses in Scotland)	0	0	0	0
Academic/IC to public sector to business (involving at least 1 business in Scotland)	7	26	23	3
Individual Projects	-	0	-	0
Total	37	46	41	5
Collaborative projects in the pipeline	0	-	-	14

Source: MEF

Commercialisation

During Phase 1, there were some 39 instances of collaborative projects leading to an intention to commercial launch/application, most often a new business process. For Phase 2, to date, there are three instances of collaborative projects leading to an intention to commercial launch/application (of five projects completed to date) (see Table A. 7).

Table A. 7 SAIC: number of IC collaborative projects leading to intention to commercial launch/application.

Level	Phase 1	Phase 2	Total
New or improved products developed (with/for a business in Scotland)	9	1	10
New or improved processes (with/for a business in Scotland)	15	0	15
New or improved services developed (with/for a business in Scotland)	6	1	7
New or improved business models (with/for business in Scotland)	6	1	7
New or improved delivery of a public service in Scotland	3	0	3
Total	39	3	42

Source: MEF (phase 1 to Jul 2019, phase 2 Jul 2019 to Jul 2022).

A number of findings from the beneficiary surveys related to activities and outputs are noted below.

In terms of engagement with SAIC, just under two-thirds of respondents (61%) first interacted with the IC on or before 2018 (broadly consistent with Phase 1). Over nine in 10 clients (91%) are still involved with SAIC, and some 44% have been involved with the IC for five years or more.

There are high levels of collaborative project involvement activity with clients. For SAIC, some 58% of respondents were involved in a collaborative project between more than one partner. Some 42% were in collaboration projects with one other partner. A further 9% were involved in consultancy projects.

It is noted that 18% of respondents had taken postgraduate internships, placements, or secondments. Many clients have also accessed lower intensity support e.g., 32% for advice and signposting, 53% conferences and events, and 25% training and development support.

For collaborative project support, around one in four (26%) had accessed four or more rounds of IC funding. More typically clients accessed one or two rounds of IC support (37%). It is also the case that SAIC survey beneficiaries have often engaged with other ICs, particularly TDL, CENSIS, and IBioIC. Examples include SAIC and IBioIC co-supporting the Scottish start-up Eco Clean Team in undertaking a research project with experts from the University of St Andrews to develop a new process that uses by-products from fish farming to produce surfactants – one of the main components in detergents and other cleaning products; and a joint project with CENSIS on an innovative weather station that uses IoT (Internet of Things) sensors to provide more site specific, real-time weather conditions than conventional forecasts.

The client survey demonstrates SAIC client engagement across a wide range universities (most prominently via collaborative projects as noted in Table A. 6 above). SAIC clients tend to engage most often with the University of Stirling (44%), as the host institution of the IC but not exclusively so. It is acknowledged by one senior board member that SAIC was “at first Stirling oriented”, but that now applications are received from across Scotland [36]. The University of the Highlands and Islands is also an important partner for clients (24% of respondents).

Engagement with colleges is on a smaller scale, with most respondents indicating they did not work with a college.

To a significant extent, findings from a survey of students reported in the main report reflect those for SAIC specifically, and are not repeated here. More generally, Brexit was noted by stakeholders to have created barriers for uptake of MSc and PhD positions due to eligibility rules [30, 35].

5 Outcomes and impacts.

5.1 Main findings from MEF.

The MEF records jobs created by business in Scotland during Phase 1 and Phase 2 to date (1,245 in total). A further 464 are recorded as safeguarded (Table A. 8). New turnover generated (or safeguarded) by business in Scotland is also recorded at a high level: £279 million new turnover generated, and £941 million safeguarded for both Phase 1 and 2 (Table A. 9). These figures are derived from business forecasts at the end of projects (over an unspecified time period). Figures are ‘gross’ and

do not take account of the counterfactual (i.e., not 'net additional'), and do not include any optimism bias assumptions. This was not required in the MEF.

The MEF doesn't examine the international dimension to employment impacts, that is, recording the number of businesses assisted to relocate or establish new facilities in Scotland. It is noted that Stakeholders did not highlight inward investment as an area that they see SAIC delivering on strongly. However, it is noted that the IC works with a number of international industry players, promoting sustained activity in Scotland. SAIC also identifies examples of support to companies based overseas where their advice has helped them access and expand into Scotland and attract UK funding support. These include Canadian company East Coast Innovations; Norwegian companies Patogen, Fjord Maritime, Optoscale and Stingray; Japanese company Uhuru United, and Anglo-Dutch company Deep Branch Bio¹⁴, although specific figures on jobs or turnover associated with these investments is not available at the time of writing.

Table A. 8 SAIC: anticipated jobs supported/created.

Level	Phase 1	Phase 2	Total
New jobs generated (by business in Scotland)	709	536	1,245
Existing jobs safeguarded (by business in Scotland)	14	450	464
Total	723	986	1,709

Source: MEF (phase 1 to Jul 2019, phase 2 Jul 2019 to Jul 2022).

Table A. 9 SAIC: anticipated turnover supported/created.

Level	Phase 1 (m)	Phase 2 (m)	Total (m)
New turnover generated (by business in Scotland)	£154	£125	£279
Existing turnover safeguarded (by business in Scotland)	£217	£724	£941
Total	£371	£848	£1,220

Source: MEF (phase 1 to Jul 2019, phase 2 Jul 2019 to Jul 2022).

SAIC records some 34 posts created in Scottish HEIs to support demand led academia-business projects (with no other posts created in colleges or the public sector) (see Table A. 10).

Table A. 10 SAIC: posts created in Scottish HEIs/colleges/public sector.

Level	Phase 1	Phase 2	Total
New posts (in Scottish HEIs) created to support demand led academia-business projects..	24	10	34
New posts (in Scottish colleges) created to support demand led academia-business projects..	0	0	0
New posts (in Scottish public sector) created to support demand led academia-business projects.	0	0	0
Total	24	10	34

Source: MEF (phase 1 to Jul 2019, phase 2 Jul 2019 to Jul 2022).

5.2 Main findings from survey of beneficiaries.

5.2.1 Outcomes.

In terms of influence on relationships with innovation partners, SAIC has played a significant role in developing client relationships with a wide range of bodies relevant to the innovation ecosystem. **Since working with SAIC 49% of clients have introduced new or significantly improved goods, services, or processes. Some 45% significantly attribute these introductions to SAIC.**

¹⁴ SAIC correspondence, March 2023.

Selected findings are:

- Some 46% of respondents indicate SAIC has significantly supported clients to develop better relationships with universities or colleges.
- 42% of respondents indicate SAIC has significantly supported relationships with private sector clients/customers.
- 27% of respondents indicate SAIC has significantly supported relationships with conferences, trade fairs, or exhibitions.
- 24% of respondents indicate SAIC has significantly supported relationships with professional and industry associations, and with suppliers.
- A further 22% of respondents indicate SAIC has significantly supported relationships with government or public research institutes.

SAIC client establishments also invest in a wide range of innovation activity. Thus, some 60% of those surveyed carried out internal R&D since they started working with the IC (half of these saying that SAIC played a significant role in supporting this activity). A further 39% undertook training or skills development for innovative activities (again just under half of these saying that the IC played a significant role in supporting this activity).

Over a quarter of SAIC clients have introduced new or significantly improved services since they started working with the IC (27%) and just under a quarter (23%) new or improved goods. A further 19% had introduced new processes. Where these have occurred, the IC has typically played a significant role (from around half to a quarter of respondents stating this).

Some 9% of clients had also started a new business or spun-out a business, with the IC playing a significant role in around half of these instances. A smaller proportion had patents granted (5%), with the IC having a similarly significant role in around half of these.

Some 85% of SAIC clients cite significantly improved networking benefits as a result of working with SAIC (that is, number of business, academic, public or third sector contacts). A range of other networking benefits were cited (where SAIC played a significant role), including:

- New business contacts - 50% of respondents reporting this.
- New academic contacts - 45%.
- Joint venture with academic institution - 37%.
- Joint venture with business - 33%
- New public sector contacts - 22%.

Some 73% of SAIC clients cite significantly improved aspects of knowledge benefits as a result of working with SAIC (improved awareness of academic capabilities, public or private sector support). SAIC clients also identified a range of knowledge benefits, including:

- Improved technical understanding of priority technology areas in my sector - 45%.
- Improved cross-industry collaboration - 45%.
- Improved awareness of academic capabilities - 42%.
- Improved market understanding of priority technology areas in my sector - 32%.
- Improved awareness of other public sector support - 19%.
- Improved industry or technology foresighting - 19%.

It is noted that, in line with other ICs, those clients involved in collaborative projects through SAIC have typically started at the lower end of the TRL scale. Some 57% of projects were at TRL 1-3 at the start (it is noted this may include project work before IC involvement). As one academic SAIC board member commented that TRL 4-5 "is where SAIC should focus on projects that need to get into the field with industry", a niche that is difficult to get funding for, and this area of research "isn't well covered and needs a mechanism" [56].

It is noted that, SAIC guidance to applicants states that they will typically fund projects within TRL 4-7, which they consider accurate for the majority of projects they have funded¹⁵. SAIC do engage earlier with signposting or support to nurture future applications, but they note, funding would generally not be committed until applications are at TRL 4. There are a small number of applications to UK Research Councils for earlier TRL stage research to which SAIC note they have made relatively modest financial contributions, on the basis the pure research will lay the foundation for relevant applied research to follow on, to the benefit of Scottish aquaculture.

When clients look forward to the next three years, those at TRL 7-8 are expected to account for 63% of the total. In all, some 63% of clients thought SAIC was 'very' or 'extremely important' in advancing their project TRL.

To a significant extent, findings from a survey of students in the main report reflect those for SAIC specifically, and are not repeated here.

5.2.2 Impact.

This section discusses the impacts of SAIC in terms of employment and Gross Value Added (GVA). The analysis of impacts includes an assessment of additionality (as outlined in appendix A).

A further question on additionality was included in the client survey. **Some 87% of SAIC clients report full or partial additionality.** In all, 17% say they would not have achieved any of the benefits without SAIC support (absolute additionality), whereas 7% say they would have achieved the same benefits at the same time and scale without SAIC support (zero additionality).

However, the majority of additionality is through increasing the scale of benefits, or bringing forward the timing of benefits. The greatest percentage of respondents (30%) say they would have achieved a significantly smaller range of benefits, at a reduced scale, and it would have taken longer to achieve them. A further 31% report more limited benefits. One senior board member commented on the nature of SAIC's work with one large aquaculture producer where the firm's investment of "£200k in research in SAIC" had "saved them £10 million in the last 10 years" [36].

In general terms, evidence for attributable employment benefits is positive (400 peak employment headcount). While the employment level of beneficiaries appears to have grown over the period under review, this is mainly a feature of having a higher frequency of respondents in more recent years. Many respondents do not expect employment gains to be carried forward into financial year ending 2025. This may be a function of a very challenging economic environment and moves to reduce headcount.

Estimates of employment additionality (that is, the difference support has made over and above what would have happened anyway) are noted for all years. This is the case whether employment multipliers are used or not. For those respondents working with SAIC before the later stages of Phase 1, few additional employment benefits are identified. This is likely a reflection of both lower respondent numbers and the difficulty in retrospectively attributing benefits to the IC programme after a lengthy period of time.

For those beneficiaries engaging in the programme from between one and five years ago, there are higher levels of additional employment identified, although still moderate in absolute terms. This suggests two things. Firstly, benefits of participation, while moderate in employment terms, are probably identified after a period of several years. Secondly, the nature of the interventions, involving relatively low-intensity interventions in some cases, or focused on projects that are often sometimes some distance from commercialisation, does not easily translate into attributable employment benefits.

The employment benefits identified are associated with increased economic benefits in terms of Gross Value Added. Cumulative net additional GVA of £67.7 million (at constant prices) for the period 2012- 2022 is estimated.

¹⁵ SAIC correspondence March 2023.

It is emphasised that the reported results relate to a relatively small sample of beneficiaries and that the grossed up figures presented are indicative. However, it is noted that the employment forecasts are broadly in line with SAIC's forecast to create 600 additional full-time equivalent jobs by 2026¹⁶.

5.2.3 Wider impacts.

With a supply-led approach, the impacts of SAIC are primarily centred on supporting industry, rather than wider public service delivery. Nonetheless, SAIC note their funded areas of research on the benthic environment, resource utilisation and treatment/elimination of waste have global relevance, and that as such, as well as helping Scotland's transition to Net Zero and a circular economy, they can put Scotland's research base and businesses at the forefront of global solutions for reduced environmental impact.

In addition, SAIC has sought collaborations to support the Net Zero transition, including with other ICs engaging with organisations such as Zero Waste Scotland, IBioIC and SEM (Aberdeen-based specialists in water and water effluent treatment) to minimise the impact of waste and create by-products. SAIC has also supported the North Ayrshire Blue Economy Strategy, the Bioeconomy Cluster Builder, the Aquaculture Supply Chain Cluster Builder, the UHI Aquaculture Hub and the UK Aquaculture Research Collaboration Hub.

In considering the wider benefits of SAIC support of clients, clients were asked which, if any, of the UN Sustainable Development Goals (SDGs) had their establishment made a significant contribution to, as a result of working with the Innovation Centre. **Some 77% of SAIC clients report that SAIC made a significant contribution to achievement of wider benefits.** A wide range of benefits are cited by SAIC clients, particularly in relation to:

- Life below water (e.g., conservation and sustainable use of marine resources) (48%).
- Industry, innovation and infrastructure (e.g., adoption of new medium-high, and high technologies) (35%).
- Zero hunger (e.g., improved food security, nutrition and sustainable agriculture) (37%).
- Decent work and economic growth (e.g., creating employment opportunities and improving productivity) (20%).
- Gender equality (e.g., empowering women and girls) (19%).

Previous research has also pointed to wider benefits in relation to sustainability (e.g., fish as a sustainable protein source, protection of the aquatic environment, and reduction of imprinted ingredients), improved public perception of the aquaculture sector, and societal (e.g., providing sustainable and secure employment in rural areas)²¹.

It is noted that SISP members commented that work on the socio-economic impact of disease and animal health on the economics of aquaculture, and work on the social licence for local and national political support for aquaculture, were likely to become increasingly important (stakeholder comment and SAIC MEF, 2022).

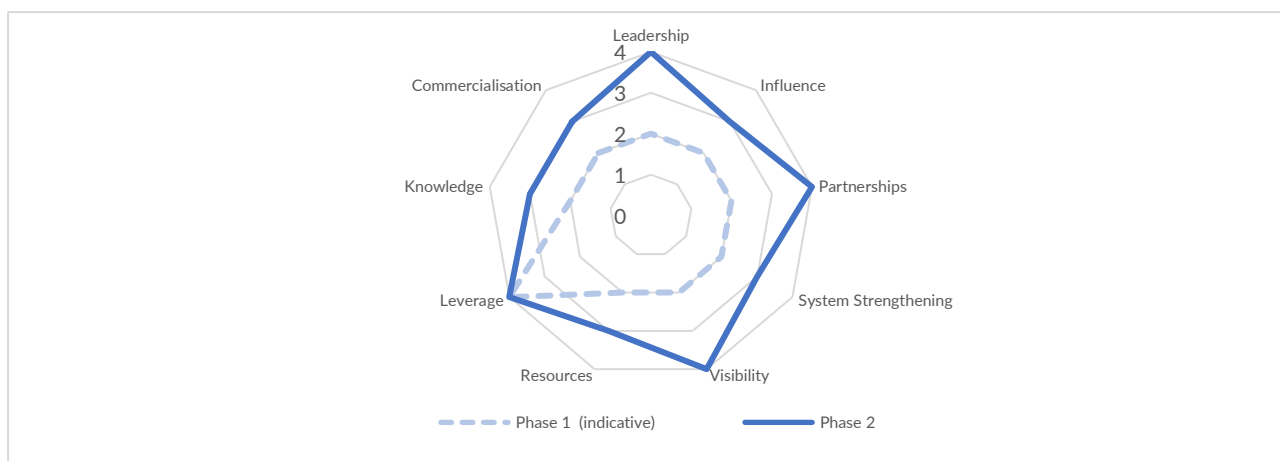
The case studies below provide further insights in to the nature of wider impacts derived from SAIC activities.

5.3 Assessment of innovation ecosystem benefits.

The evaluation objectives include an assessment of how effective each IC has been in building engagement in its own ecosystem. The approach to assessing the role of ICs within the wider innovation ecosystem is set out in Appendix A, and summarised for SAIC in Figure A. 2 (authors' scoring).

¹⁶ Independent economic impact assessment based on 60 SAIC-funded projects, October 2021, cited in SAIC (2022) Annual Report 2021-2022, SAIC: Stirling. SAIC forecast that projects will contribute to an increase in aquaculture turnover of £50m per year by 2026, of which £30m is directly attributable to SAIC. This gross turnover of £50m per year from 2026 is predicted to rise to £100m per year by 2031.

Figure A. 2 SAIC innovation ecosystem benefits.



Source: authors

System Leadership

Based on this framework, Phase 2 has witnessed a strong performance from SAIC in relation to leadership, influence and partnerships, as discussed above.

Leadership

- In terms of leadership, the convening role of SAIC was viewed as important. The convening role of SAIC was emphasised by one senior board member, commenting that it would be “very difficult for someone else to fulfil that role” [36]. They regarded SAIC as generally being “always one step ahead” and “quick off the mark on relevant issues” [36].
- Atlantic salmon production dominates the Scottish aquaculture sector by volume and value and SAIC clearly have a strong focus on this sub-sector. Other finfish and shellfish are also within SAIC’s remit and the evaluation did not receive any feedback from stakeholders in these areas specifically. However, it is noted the IC’s PIA three relates to Shellfish and other non-fish species with ongoing projects in these areas (some five ongoing or completed).
- SAIC was also identified as identifying opportunities and solutions to partners and stakeholders. The formation of an independent advisory panel was viewed as an important factor in providing strong leadership on issues [73]. As noted in section 6.1, the SAIC’s independent scientific panel has played a significant role in providing independent review of collaborative project applications aligned with SAIC’s priority innovation areas [35].
- A senior Marine Scotland official commented that, while policy was for government, “SAIC delivers on key challenges for aquaculture”, demonstrating “impressive strategic leadership”[73], and that SAIC was “central to addressing” some key challenges “via innovation” [73]. Additionally, that SAIC were “immersed in the sector, with expertise in different areas” and the body was “very good at filtering and identifying applications” and good at “spotting trends and issues” [73].
- When questioned directly, some 38% of SAIC clients stated that SAIC had been a significant source of support for the wider innovation ecosystem in terms of in terms of providing strategic leadership for the sector or technology area. In addition, 42% of SAIC clients stated that SAIC had been a significant source of support for their establishment in terms of acting as a source of sector or technology expertise.

Influence

- Considering ‘influence’, where SAIC gets engaged in activities that help define the roles of partners, gets partners to commit to shared objectives, or influences funding allocations, then

SAIC notes a number of influencing actions including, for example, working with Marine Scotland on aquaculture regulation and planning (e.g., contributing to Farmed Fish Health Working Group strategic framework document), and working with Lantra on the Commission for Rural Skills [35]. It is noted that Marine Scotland have observer status on the SAIC board and are in regular contact with SAIC on strategy and governance issues [73].

- The development of this influencing role during Phase 2 has permitted SAIC to “contribute actively to discussion and development of relevant policy by the Scottish and UK governments. This includes supporting Marine Scotland to develop clear research objectives around climate change in aquaculture, define mechanisms for innovation, and build capacity and productivity across the sector”¹⁷. In support, a SAIC board member noted that the body do well at influencing Scottish Government strategy, being “seen as independent, but not run by industry” [76].
- Questioned directly, a moderate level of 22% of SAIC clients stated that SAIC had been a significant source of support for the wider innovation ecosystem in terms of in terms of effective policy or strategic influence.
- As noted under ‘leverage’ the number of UKRI funding partnership in which SAIC is a partner emphasises the influencing role SAIC has with UK funders, as well as helping to shaping the scope of future funding calls ensuring they are aligned to necessary industry developments.
- It is noted that SISP members felt that SAIC could assist an improved understanding of the importance of aquaculture per se at Scottish and UK governmental levels. The SAIC team is reviewing this, including in the context of a SAIC proposal to Marine Scotland for a ministerially led delegation of Scottish organisations to undertake a ‘learning journey’ to Norway in 2023, and SAIC leading Scotland’s bid to host an International Sea Lice conference in 2024¹⁸.

Partnerships

- Looking at the dimension of partnerships, there is a range of evidence indicating the effective role of SAIC. A strong indication of partnership is the number of collaborative projects and partners, with 82 unique partners engaged in 46 projects¹⁹. The MEF indicates some 37 collaborative projects in phase 1 and 46²⁰ in phase 2 (underway or completed), and a further 14 in the pipeline (all involving at least one business in Scotland).
- It is noted that 18 (22%) of SAIC’s collaborative project partners are SMEs and that through these projects they have an opportunity to work alongside (and share knowledge with) larger, established businesses²¹. This remains a relatively low proportion, although it is noted 61% of SAIC’s consortium members are SMEs, so there appears increasing opportunity to engage more SMEs in collaborative research in the future²¹.
- As noted above, the client survey respondents confirmed a high level of collaborative project involvement (58% with more than one partner), often sustained over multiple round of IC support (26% accessed four or more rounds). Some 45% of SAIC clients also report improved cross-industry collaboration.
- Questioned directly, some 44% of SAIC clients stated that SAIC had been a significant source of support for the wider innovation ecosystem in terms of in terms of acting as a strategic partner e.g., developing or sustaining new strategic or longer-term partnerships. In addition, 49% of SAIC clients stated that SAIC had been a significant source of support for their establishment in terms of supporting the development of trust between their organisation and

¹⁷ SAIC (2021) SAIC response to SF: fueling Scotland’s green recovery in the emergency years, SAIC: Stirling, p5.

¹⁸ SAIC (2022) MEF, August, SAIC: Stirling.

¹⁹ SAIC (2022) Annual Report, SAIC: Stirling.

²⁰ Of the 46, 21 ‘core’ projects and 25 ‘external’ projects (July 2022 MEF).

other organisations in their sector/technology area. Some 37% of clients indicated a joint venture with an academic institution, and 33% with business.

- It was also noted above that SAIC survey beneficiaries have often engaged in partnership with other ICs, particularly TDL, CENSIS, and IBioIC. An example includes SAIC and IBioIC co-supporting the Scottish start-up Eco Clean Team in undertaking a research project with experts from the University of St Andrews to develop a new process that uses by-products from fish farming to produce surfactants (one of the main components in detergents and other cleaning products)²¹. One stakeholder commented the IC was “doing well in reaching out to other sectors” including via other ICs [30]. In the case of the latter, to secure co-funding as well as, for example, for events and webinars [35].
- In terms of strategic partnership, a senior Marine Scotland official also noted that SAIC had worked closely with government to propose and run a call for projects on behalf of government for the first time, providing a quick and robust process (at Marine Scotland’s invitation, SAIC also submitted proposals to run a specific project call on marine mammal interactions with farmed fish).
- This work facilitated consideration of a range of projects feeding into government response on an issue [73] and is considered a template for future partnership working with government. SAIC was invited to join the Farmed Fish Health Framework (FFHF) Strategy Group, chaired by the Director of Marine Scotland in 2022. The strategic direction of the work of the FFHF is now subsumed within the Scottish Aquaculture Council. It is noted that the SAIC CEO joined the Scottish Aquaculture Council which met for the first time on 27 June 2022.
- SAIC submitted three outputs to Marine Scotland on project work undertaken on Harmful Algal Blooms. This included guidance for industry on Standard Operating Procedures for monitoring the risks to fish health of harmful algal blooms; an assessment of the availability of data on routine dissolved monitoring in Scottish waters; and a set of recommendations for future projects to address and support enhanced understanding of the risks and impacts of climate change on environmental conditions as they impact on Scotland’s fish and shellfish farmers.

System strengthening

- In terms of creating synergies and facilitating academic-industry networking, a senior Marine Scotland official commented that SAIC were “very well networked with academia and industry”, which facilitated the identification of new business opportunities, that is, “good at spotting projects” and linking academic expertise to business. An academic stakeholder similarly commented on “a lot of interaction with academic and industry networks”, that provided a “one stop shop” for that individual, with SAIC very much part of developing that network [56].
- The MEF and other evidence suggests SAIC has been successful in creating synergies and facilitating academic-industry networking. The expansion of networking activities demonstrates the development of 273 consortium members of which 166 (61%) are SMEs²¹. SAIC note that SMEs, “particularly when breaking into the aquaculture sector as a new market, often need nurturing, signposting, and detailed guidance before funded collaboration becomes an option”.
- An example of work in that area includes a series of Scottish Aquaculture 101 webinars to a subsea/blue economy business audience, and series of online and in-person ‘Meeting of Minds’ events with the Lochaber Chamber of Commerce²¹. It is also noted that SAIC is closely involved in a cross-sector initiative exploring the possibilities of creating a Scottish Aquaculture Supply

²¹ SAIC (2022) SAIC annual report, 2021-22, SAIC: Stirling.

Chain cluster, to harness expertise and innovation in order to increase domestic and international business opportunities²¹.

- In terms of creating linkages between partners, an initial Phase 2 target of 19 instances of signposting has been well exceeded, with a year three achievement of 113. SAIC note this increase is due to the additional focus on this area and a considerable effort that has gone into developing their CRM system, which now captures this²². Follow on specifically from collaborative projects is at a lower scale: 30 instances in Phase 1, and six to date in Phase 2.
- When asked directly, some 52% of SAIC clients stated that SAIC had been a significant source of support for the wider innovation ecosystem in terms of in terms of fostering synergies and networking within their sector or technology area. The survey of SAIC clients also pointed to engagement with a wide range of higher education institutions, particularly the University of Stirling and UHI (there remains a strong focus on these two institutions given their prominence in the sector). An SE stakeholder commented that collaborative working with academics had “gone very well”, picking out work with UHI, Glasgow University and the University of the West of Scotland [30]. However, engagement was limited with colleges in terms of range of institutions and number of collaborations.
- The survey of SAIC clients also demonstrates a positive contribution to a collaborative culture with SAIC playing a significant role in developing client relationships with a wide range of bodies relevant to the innovation ecosystem, e.g., 46% of respondents indicate SAIC has significantly supported clients to developed better relationships with universities or colleges, and 42% with private sector clients/customers. In particular the client survey indicates a range of networking benefits to SAIC clients, with for example 50% of clients point to new business contacts, and 45% to new academic contacts.

System Resources

Visibility

- Visibility (primarily in relation to markets and investors) is also positive, with multiple examples of advocating the needs of the sector, regionally, nationally and increasingly internationally, as well as engaging in a number of international R&D projects. For example, SAIC has supported projects alongside the European Institute of Innovation & Technology (EIT) funding vehicle (EIT Digital project Aquaculture Insights and the EIT Food project BREEZE). The former in a collaboration with partners from Scotland, Japan, the Netherlands and Norway. Although one board member noted that while the organisation’s reach was wide in a Scottish context, there was scope to do more internationally [76].
- SAIC also note that they represented Team Scotland at Aqua Nor 2021, the world’s largest aquaculture sector gathering and also had presence at Aquaculture UK, the largest event of its kind in the UK. SAIC has also hosted international conferences on gill health, Ballan wrasse, lumpfish and harmful algal blooms, creating forums for knowledge exchange on key topics and challenges²¹.
- When questioned directly, some 58% of SAIC clients stated that SAIC had been a significant source of support for the wider innovation ecosystem in terms of in terms of raising the profile of the sector/technology area within Scotland. In addition, some 33% of SAIC clients stated that SAIC had been a significant source of support for the wider innovation ecosystem in terms of in terms of raising the profile of the sector/technology area internationally. Further, 50% of SAIC clients stated that SAIC had been a significant source of support for their establishment in terms of supporting improved visibility within sector/ technology area.

²² SAIC correspondence March 2023.

- SAIC led events have played a key role in this regard, with 47 events (<100 attendees) as at Phase 2, year three, and nine events of greater than 100 attendees. In addition, there have been some 88 media releases in the same period.
- It is noted that SISF members saw opportunities for more international cooperation, specifically but not exclusively between Scotland and Norway collaboration through e.g., joint ventures involving SAIC, the Norwegian industry body FHF, and the Norwegian Research Council²³.

Resources

- Within this criteria, the main SAIC focus to date is on improved organisational capacities or ways of working. In this regard, some 29% of SAIC clients stated that SAIC had been a significant source of support for their establishment in terms of supporting the sharing of common resources. An example includes SAIC's production and gathering of resources that can be used freely to help introduce aquaculture into the curriculum. SAIC has also created the Aquaculture HR Directors Group, bringing businesses together to work with public sector agencies to enable them to respond more swiftly to the skills and recruitment challenges faced by the sector.
- In addition, SAIC has supported the University of Stirling's Institute of Aquaculture (IoA) in the establishment of The National Aquaculture Technology and Innovation Hub (NATIH) which aims to be a pioneering innovation centre set-up to drive the UK's ambitions to become a world leader in modern aquaculture practice. The hub will deliver new, state-of-the-art laboratories and aquatic experimental facilities. NATIH is due to open in 2024 and is a £17 million investment by the Stirling and Clackmannanshire City Region Deal²⁴.

Leverage

- With regards to leverage, as discussed above, SAIC has proved very effective during the course of Phase 1 and Phase 2 at meeting the relevant criteria, including securing Scottish and other UK funding public sector research funding, supporting application for funding, and attracting new investment to Scotland. As noted below, SAIC reports a leverage rate (£:£) of 4.36 on total project funds committed, as of August 2022.
- SAIC has exceeded its full life target for external funding (£3.5 million), with a Phase 2, year three achievement of £5.9 million. For example, the SAIC-funded collaborative Core Hatchery project formed part of a successful £4.4 million application for the Shellvolution project to the Islands Deal²¹. It is noted another £1 million non-SAIC project was a forerunner to the £4.4 million Shellvolution project and SAIC have been invited onto the project steering group.
- Other examples above note successful partnerships with European funders. It is noted of 22 non-core projects some six have attracted significant Biotechnology and Biological Sciences Research Council (BBSRC) funds, 12 Seafood Innovation Fund funding (SIF), two Industrial Strategy Challenge Fund (ISCF), and one European Maritime and Fisheries Fund funding (EMFF).
- As noted in 6.3.3, based on this evaluation's analysis, some £42 million was mobilised over Phases 1 and 2. Of this, 74% was industry finance. SAIC has been very successful in supporting business to leverage project funding, with and without academic partners. It is noted that this is what has been committed/received to date: further contributions are expected by SAIC as the projects complete, with £49.9 million expected when all projects as funded and included in the July 2022 MEF are completed²⁵.

²³ SAIC (2022) MEF, August, SAIC: Stirling.

²⁴ <https://www.stir.ac.uk/about/faculties/natural-sciences/aquaculture/national-aquaculture-technology-and-innovation-hub/>

²⁵ SAIC correspondence March 2023.

- Questioned directly, some 45% of SAIC clients stated that SAIC had been a significant source of support for the wider innovation ecosystem in terms of in terms of promoting investment and leverage of resources into the sector/ technology area from within Scotland. In addition, 23% of SAIC clients stated that SAIC had been a significant source of support for the wider innovation ecosystem in terms of in terms of promoting investment and leverage of resources into the sector/ technology area from outside Scotland.
- It is noted that SAIC has provided advice, support and guidance to multiple consortium members in preparing their own bids to the Marine Fund Scotland, the Seafood Innovation Fund and the Fisheries Industry Science Partnership fund. SAIC see this service as providing significant benefit to those who access their expert advice and note consideration of case for charging for these application review services in future.

Knowledge

- SAIC has been active across a number of skills development areas, including:
 - Development and delivery of a Leadership and Innovation skills programmes.
 - Promoting aquaculture as a rewarding career path via the ongoing 'New Wave of Talent' programme.
 - Development of the Aquaculture HR Directors Group, bringing businesses together to work with public sector agencies to enable them to respond more swiftly to the skills and recruitment challenges faced by the sector.
 - Funding of MSc and PhD places for students to allow them to undertake applied research within aquaculture.
- SAIC cite delivery of a number of innovation, leadership and mentoring programmes, supporting 215 trainees through non-accredited programmes, developed by SAIC to meet the needs of Scotland's aquaculture sector²⁶.
- The maintenance of a positive contribution on the knowledge dimension is also evident, for example in the master's and Ph.D. programme, as well as a range of wider skills development initiatives. Some 55 MSc students, and five PhD students are recorded as at Phase 2, year three, along with eight summer interns. Some four PhDs and 86 MSc were recorded for Phase 1. SAIC also highlights some 246 dissemination events. These were primarily held during Phase 1 (153 events), with a lower number in Phase 2, significantly adverse affected by the Covid pandemic. It is also noted that 24 new higher education posts were created in Phase 1, and a further 10 to date in Phase 2. No new posts were created in colleges.
- In response, a range of knowledge benefits are identified by SAIC clients, as discussed above, for example, 45% indicate improved technical understanding of priority technology areas in their sector. In addition, some 40% of SAIC clients stated that SAIC had been a significant source of support for the wider innovation ecosystem in terms of supporting knowledge development and dissemination (e.g., new courses, university or college networks, attraction of talent). Further, 41% of SAIC clients stated that SAIC had been a significant source of support for their establishment in terms of supporting diffusion of knowledge and good practices.
- It is noted that SAIC is increasing its commitment to awareness-raising, information dissemination and knowledge exchange from completed projects. SAIC are also seeking to implement a SISF recommendation that project applicants prepare clear adoption and dissemination plans as part of original concept proposal, so that routes to industry application were clear.

Commercialisation

²⁶ SAIC correspondence, March 2023.

- With regard to supporting activities leading to commercial or public sector exploitation, the client survey has demonstrated a wide range of innovation investment by SAIC clients, with, for example, around 30% indicating SAIC played a significant role in investment for internal R&D. The MEF also indicates SAIC has supported activities leading to a range of new products (38), services (21) and process (41) available for commercial or public sector exploitation as at Phase 2, year three. The client survey supports the view that SAIC support plays a significant role in much of this activity.
- The fostering of new technologies and experimentation with clients is also evidenced by a strong contribution to the advancement of project TRLs, with 63% of clients stating that SAIC was 'very' or 'extremely important' in advancing their project TRL.
- The MEF claims some 39 instances of collaborative projects leading to intention to commercial launch/application during Phase 1 and a further three to date during Phase 2. Some 35% of SAIC clients stated that SAIC had been a significant source of support for the wider innovation ecosystem in terms of in terms of encouraging experimentation and commercialisation in Scotland (e.g., start-ups, spin-outs, testing of new technologies, demonstrating new technology or processes).
- Evidence of new companies or spin outs are at a lower level. The client survey indicates that some 9% of SAIC clients had started a new business or spun-out a businesses, with the IC playing a significant role in around half of these instances. In addition, 12% of SAIC clients stated that SAIC had been a significant source of support for the wider innovation ecosystem in terms of in terms of encouraging foreign companies to establish in Scotland.
- MEF claims based on business forecasts at end of project are substantial (709 new jobs by business in Scotland) for Phase 1 and 536 for Phase 2 to year three; £154.3 million new turnover generated by businesses in Scotland for Phase 1, and £124.8 million for Phase 2)²⁷.

6 Delivery and value for money.

6.1 Governance and operational arrangements.

SAIC was established in 2014 and has been hosted by the University of Stirling throughout that period, providing a continuity of host arrangements. In common with other ICs, the University of Stirling, as host institution, employs all SAIC staff and handles all financial matters, including the receipt of core funding, the contracting and financing of all project funds, and others matters.

SAIC is subject to University of Stirling policies and procedures on Human Resources and Finance and falls within the scope of University of Stirling audit and compliance arrangements. All matters of strategy and operations are under the control of the SAIC Board. The University of Stirling has a representative on the SAIC Board. It is noted that Phase 2 funders asked SAIC to undertake a knowledge and skills analysis of their Board. This was done and continues to positively influence Board member recruitment.

It is noted that SAIC is directed by its independent board on strategic activities. The board is currently made up of non-executive members with a range of relevant experience from industry and academia. Currently there are 12 members (up from six members pre-commencement of Phase 2). This expansion broadened membership to encompass greater representation from SMEs, shellfish producers and women.

An SAIC Independent Scientific Panel (SISP) has been established to support project review and approvals (11 members at time of writing). The SISP plays a vital role in guiding SAIC's work, and was seen as ensuring integrity by one senior government stakeholder [73]. The primary purpose of the

²⁷ Gross.

panel to provide independent and informed scientific opinion on SAIC sponsored projects to the officers or board of SAIC.

It is noted that SAIC only achieved their full staffing complement in year five of Phase 1²⁸, with a current team of 13 (headcount) and significantly smaller than some other ICs. Stakeholders noted challenges in recruitment and retention (a common theme across ICs), with host university and ICs working to resolve personnel structures, and resourcing of posts at competitive salaries, but with the process taking longer than ideal, with a “knock on effect on project activity and spend”[30, 76].

Host university relations at the current time are generally regarded as positive (in terms of governance and strategic fit) by both host and centre, notwithstanding recruitment and retention challenges noted [30, 35, 36, 73, 76]. It was noted specifically that in relation to certain funds²⁹, the classification of SAIC as an academically hosted body limits the funding that can be accessed versus an ‘industry’ status, or in some cases only one academic partner can be included, which generally prevents SAIC application alongside a Scottish university [35].

However, any difficulties in university-IC hosting arrangements were generally viewed to be surmountable and to outweigh the governance risks of a more fully autonomous organisational arrangement for the IC [36].

The five year funding window was regarded by one board members as reasonable for projects, but in general it was the view of stakeholders that it would be beneficial for the organisation to have a longer funding window to ease planning and staffing considerations [35, 36, 76]. Another funder stakeholder did not view the five year funding cycle as a significant factor in staff retention or turnover challenges, rather competition from the private sector [30]. The potential role of other funders was raised by a stakeholder e.g., Marine Scotland, with whom the centre has worked closely [36].

A strong customer relationship management (CRM) system and a culture of evaluation has supported management decision making in SAIC and helped to support relationship building amongst consortium network members (supporting deepening and strengthening of the innovation ecosystem).

There are very good satisfaction levels with SAIC support across the board, notably:

- 96% satisfaction with IC conferences and events.
- 95% satisfaction with collaborative project support (more than one partner).
- 95% satisfaction with advice and signposting.
- 93% satisfaction with collaborative project support (one partner).
- 92% satisfaction with post-graduate placements.
- 92% satisfaction with consultancy support projects.

One academic commented that the SAIC project management was very professional, “a pleasure to work with” and provided a “firm but fair” approach to project management [56].

Marginally lower levels of satisfaction (although still very high):

- 89% satisfaction with support for a consultation process.
- 88% satisfaction with training and development support.
- 83% satisfaction with IC membership (paid or free).
- 50% satisfaction with lab, test or demonstration facilities (small number of cases).

6.2 Monitoring and evaluation.

Throughout Phase 1 and Phase 2, the funders received quarterly progress reports, and monitoring data were readily available. SAIC has provided funders with a comprehensive framework of quantitative metrics providing both internal and external stakeholders regular KPI updates at appropriate levels of

²⁸ HIE (2019) Appraisal Paper ID 9369403, HIE: Inverness.

²⁹ For example, the UK Seafood Innovation Fund <https://www.seafoodinnovation.fund>

detail. SAIC has commissioned a number of independent economic impact assessment which have informed management decision making as well as communication with stakeholders. It is noted that Phase 1 forecasts of impact were regarded as optimistic and subsequently revised down following discussion with funders³⁰.

The MEF was not regarded as having performed well with regarded to capturing the non-funded, softer aspects of SAIC’s work. For instance, the creation of informal connections [36]. In line with other ICs, reporting of often significant wider benefits is solely qualitative in nature at this time and the programme MEF would benefit from revision to capture wider benefits through the identification of appropriate qualitative and quantitative indicators and methods.

6.3 Value for money.

This section of the report sets out the main findings of the evaluation with regard to value for money.

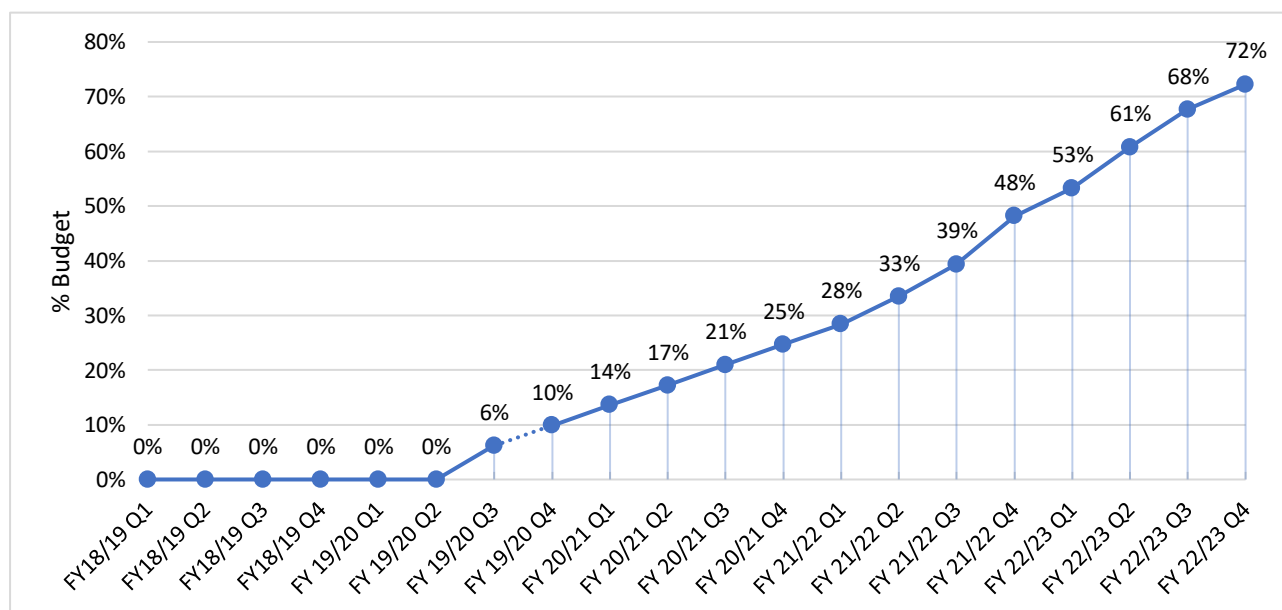
6.3.1 Limitations.

The overall programme MEF provides a limited framework of quantitative metrics that can be used to assess VfM. The main body of the report discusses the limitations in greater detail. This report uses the latest financial data available, i.e., to Dec 2023 and /or March 2023.

6.3.2 Budget execution.

Total Phase 1 spend is as £12.8 million. Funder budget drawdown is used as a proxy for expenditure. Phase 2 budget execution is noted in the table below. Quarterly drawdown is approximate. Some 72% of the funder budget has been drawn down for the period up to March 2023 with IC spend on track for the remainder of Phase 2.

Table A. 11 SAIC budget execution.



Source: SFC, SE, HIE correspondence (‘Summary funders awards and drawdowns to date’, excel spreadsheet, Feb 2023). * funders indicate awarded at outset of Phase 2.

6.3.3 Finance mobilised.

Finance mobilised (public or private) is not recorded as a specific MEF indicator. Here, it is assessed as all recorded MEF commitments (project and centre combined), excluding all funder commitments. MEF commitments are presented as supplied by the IC.

³⁰ Scottish Enterprise (2019) SAIC Phase 2 approval paper, June, Scottish Enterprise: Glasgow.

On this basis, some £42 million was mobilised over Phases 1 and 2. Of this, 74% was industry finance. Comparing funder inputs (to Jun 2022) to finance mobilised, this indicates an estimated favourable leverage of £18.1 million to £41.8 million, or 2.3:1 (benefit to cost ratio). For industry finance mobilised this is a lower 1.7:1 (see Table A. 12).

Examples of recent contributions include³¹:

- Scottish Sea Farms for CleanTreat (£222k) and BactMetBar (£241k) (reported August 2022).
- £715k of external contributions BBSRC projects (reported August 2022).

It is noted that SAIC reports a leverage rate (£:£) of 4.36 on total project funds committed, as at August 2022³².

Table A. 12 Finance mobilised, SAIC, to Jun 2021/22

	Phase 1	Phase 2	Total
Higher Education Institutes	£ 1,888,911	£ 364,000	£ 2,252,911
Other Public	£ 6,720,648	£ 1,921,000	£ 8,641,648
Industry	£ 27,644,216	£ 3,292,000	£ 30,936,216
Other	£ -	£ -	£ -
Total	£ 36,253,775	£ 5,577,000	£ 41,830,775

Source: MEF.

6.3.4 Cost per impact measure.

It is important that value for money assessments consider programme effectiveness, that is, the relationship between the intended and actual results of public spending. In other words, what are the higher-level outcomes / impact of the programme and at what cost. In this regards, two impact measures are examined: jobs and GVA. It is acknowledge that all ICs to a greater or lesser extent, have a focus on wider environmental, health, social benefits, and therefore these impact measures do not capture all of the benefits of ICs.

However, assuming costs as funder inputs of £19.6 million to December 2022, SAIC net additional peak employment of 400 equates to £48,936 per additional job. Similarly, funder input to net additional GVA equates to a benefit to cost ratio of 3.5:1.

Table A. 13 Cost per job, SAIC.

	Employment	Cost per job
Net Additional Employment (peak)	400	£48,936
Net Additional Employment (peak) (no multiplier)	222	£88,173

Source: authors.

Table A. 14 GVA ratio, SAIC

	GVA	Benefit: cost Ratio
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³¹ Note that the figures quoted from Scottish Sea Farms, BactMetBar and BBSRC do not represent the total value of contributions from these entities for the projects, rather the amounts recognised in that quarter (SAIC correspondence, March 2023).

³² SAIC (2022) MEF, August, SAIC: Stirling.

Cumulative Net Additional GVA , Constant Prices, Discounted	£67.7m	3.5:1
Cumulative Net Additional GVA (no multiplier), Constant Prices, Discounted	£37.6m	1.9:1

Source: authors.

6.3.5 Equity.

Many key aquaculture businesses and opportunities are based within the HIE region and SAIC continues to promote the region via its consortium network, 48 (18%) of which businesses are based in HIE. SAIC also holds several in-person events in the region, providing invaluable networking opportunities²¹. In addition, 21 of 82 projects partners (26%) are based in HIE. SAIC also note that of the £5.9m of external funding leveraged into projects by SAIC, £3.4m is attached to projects with SME partners or partners based in the HIE area.

There is a good geographic spread of SAIC client survey respondents, including some 30% of responses from the Highlands and Islands, reflective of a concentration of aquaculture production within this area. The Highlands and Stirling account for some 30% of establishment locations for SAIC:

- The Highland Council (15%).
- Stirling (15%).

In terms of gender, SAIC deliver the Women Returners Programme, helping to remove barriers to employment. SAIC established the Women in Scottish Aquaculture (WiSA) network, which was noted by one AIC board members as “well received” [30, 76]. Open to all, WiSA promotes the diverse and rewarding careers that are available in aquaculture, to encourage more women to enter the sector.

SAIC note that they support a range of students and interns in the HIE area:

- Six MSc students are based in HIE at Lewes Castle and SAMS.
- One summer interns was based in the HIE area and completed their internship remotely.
- One PhD students is based in the HIE area at SAMS.

7 Progress against targets and objectives

7.1 Targets.

As of Phase 2, year three, SAIC had exceeded 15 of the 17 full-life KPI targets (see Table A. 15). Of the two not met, SAIC notes that the summer intern target remains on track and will be met by the end of Year five and, due to changes in the eligibility criteria as a result of Brexit, SAIC’s MSc target will not be met in Phase 2. It is noted that SAIC have set extended stretch targets to ensure they remain ambitious in their goal-setting and achievements, including a target of £7 million for external project funding.

Table A. 15 SAIC, Progress against targets.

KPI	Year 3 achievement	Full-life target	Status
External Funding	£5,913 k	£3,500k	Exceeded
Signposting	113	19	Exceeded
Collaborative Projects	21	15	Exceeded
Collaborative Project Partners	82 4	5	Exceeded
SME Collaborative Project Partners	18	15	Exceeded
New or improved products	38	4	Exceeded
New or improved services	21	3	Exceeded
New or improved processes	41	6	Exceeded
Collaborative Project Contributions.	£5,342k	£4,200k	Exceeded
Consortium membership	273	130	Exceeded
SAIC led events < 100 attendees	47	25	Exceeded
SAIC led events >100 attendees	9	5	Exceeded
Media releases	88	40	Exceeded
Dissemination activities	246	30	Exceeded
MSc Students	55	125	Not achieved

PhD Students	5	4	Exceeded
Summer Interns	8	10	On Track

Source: SAIC (2022) Annual Report 2021-2022, SAIC: Stirling, p12.

7.2 Objectives.

As outlined in the main report, the author's identified 10 objectives at programme level, taking the objectives set out in the Phase 1 Call for Proposals and Phase 2 Business Planning guidance as a starting point. The table below explores SAIC's focus on these 10 programme objectives.

Table A. 16 SAIC achievements against objectives.

Objectives and strength of focus		Explanation of rating
O1: Direct businesses to support	High	MEF reporting indicates relatively limited signposting and follow-on during Phase 2 (for completed projects). SAIC also report 113 signposting activities for non-completed projects ³³ . However, stakeholders highlighted that SAIC is an effective member of the innovation support ecosystem, and demonstrates its commitment by directing businesses to sources of support. In addition, there has been a substantial increase in networking activity between SAIC members.
O2: Build and promote ecosystems & sectors	High	The MEF records the number of engagement events delivered by SAIC. In Phase 2 to date nine large events and 47 smaller events have been delivered. Hosting and attendance at a range of UK and international sector fora are one of the main ways SAIC builds and promotes the ecosystem and supports a wide range of actors. Although a high degree of focus on the host institution is noted.
O3: Drive business growth	High	The client survey reported that SAIC is effective at developing and facilitating collaborative R&D projects, leading to a significant degree of business growth to date (employment and GVA). The MEF also records new jobs created and existing jobs safeguarded in businesses, along with increased turnover.
O4: Win external funding	High	The MEF highlighted how SAIC have significantly exceeded targets in securing competitive funding from a range of UKRI and European sources. Several stakeholders highlighted the recent successful Islands Deal bid as an example of a funding bid that was enhanced through SAIC's involvement. In addition, SAIC has been successful across both phases in mobilising industry finance.
O5: Solve industry problems	High	This objective encourages Centres to exploit academic research to solve industry-defined problems. The Phase 1 Call for Proposal and Phase 2 Business Plan set out clear challenges that SAIC addresses, supported by an independent scientific panel. Stakeholders highlighted that SAIC is highly effective at leveraging academic expertise to support businesses, and is a highly effective intermediary. They also highlighted that SAIC's in-house delivery team provides vital support to businesses and public sector organisations.
O6: Address major policy priorities	High	Stakeholders highlighted that during Phase 2 SAIC has demonstrated close alignment with Government's major policy priorities, particularly Marine Scotland.. Stakeholders were able to identify economic, environmental and societal benefits flowing from SAIC's work.
O7: Secure inward investment	Moderate	The MEF doesn't record number of businesses assisted to relocate or establish new facilities in Scotland. Stakeholders did not highlight inward investment as an area that they see SAIC delivering on strongly. However, the IC works with a number of international industry players, promoting sustained activity in Scotland, and SAIC provides examples of overseas business where their advice has helped them access and expand into Scotland and attract UK funding support (although the scale of investment in for example, jobs, or innovation spend, is not available at this time). Stakeholders highlighted that in promoting the ecosystem with events like Aqua Nor 2021, the Centre is raising Scotland's profile internationally.
O8: Enhance public services	Moderate	The MEF records the number of collaborative projects leading to new or improved delivery of public services. In Phase 1 SAIC reported three such projects, and in Phase 2 to date they have delivered no relevant projects. However, stakeholders identified SAIC partnership work that has led to new or improved public services, particularly the partnership working with Marine Scotland.

³³ SAIC correspondence March 2023.

O9: Develop skills	High	The MEF records the number of people gaining new qualifications. In Phase 1 SAIC supported a level of 87 MSc and 43 MSc are reported in Phase 2. No PhDs are recorded. A further 215 CPD trainees are reported. It is acknowledged that stakeholders commented on a significant contribution to skills development within the sector. Relative to employment in the aquaculture sector (2,406 in 2019) the skills contribution is significant. However, to date links to colleges is an area where further development is identified.
O10: Develop next generation	High	A range of specific activities have been developed by SAIC that help promote the sector including the 'New Wave of Talent' project. SAIC report it has trained circa 140 delegates from academia and industry via their Leadership and Innovation courses ³³ . SAIC has also developed the Aquaculture HR Directors Group, bringing businesses together to work with public sector agencies to enable them to respond more swiftly to the skills and recruitment challenges faced by the sector. In addition, the Women Returners Programme, and Women in Scottish Aquaculture network support this objective. Relative to employment scale in the aquaculture sector the contribution is significant.

Source: authors

8 Impact case studies.

8.1 Introduction.

The section present the findings from a number of case studies linked to SAIC in order to provide a more an in-depth and comprehensive understanding of selected projects and to gain an understanding of why, for whom and under what circumstances the IC achieves its objectives.

8.2 Case 1. Mowi Scotland.

Mowi Scotland is part of the world's leading seafood company, and the largest producer of farmed salmon. Mowi Scotland is the largest salmon farming company in Scotland, with 1,500 employees providing fresh salmon for main markets in the UK, France, USA, Poland and China. The fish are reared in hatcheries and freshwater loch farms before they are moved to the firm's c48 sea farms on the west coast of Scotland (see Map A. 1)³⁴. Once grown to market size they are transported by sea to Mowi's Harvest Station in the port of Mallaig and onward to their processing plant in Fort William for gutting, packing and distribution to their customers around the world.

Context.

Atlantic salmon has traditionally accounted for over 95% of the aquaculture farm gate value in Scotland (with 29% of production by value in the 'North Coast and West Highlands'). The proportion for 2017 was reported at around 98%³⁵. In 2019 aquaculture generated £560 million GVA: accounting for 0.38% of the overall Scottish economy and 11% of the marine economy GVA. The aquaculture industry provided employment for 2,406 people (headcount), contributing 0.09% of the total Scottish employment and 3% of the marine economy employment.

From 2016 to 2017 the GVA from aquaculture (adjusted to 2017 prices) almost doubled from £221 million to £436 million. From 2018 to 2019, the GVA from aquaculture (adjusted to 2019 prices) increased by 45% from £387 million to £560 million³⁶.

Export sales of salmon from the UK are difficult to interpret from available statistics but appear currently to have a value in the region of £400-500 million excluding re-exports and processing of imported salmon. The USA, France and China are the main overseas markets³⁷.

³⁴ See <https://mowi.com/uk/about/>

³⁵ Scottish Government (2020) Marine Statistics 2017, Scottish Government: Edinburgh.

³⁶ Scottish Government (2022) Marine Statistics 2019, Scottish Government: Edinburgh.

³⁷ The Value of Aquaculture in Scotland, A Report for Highlands and Islands Enterprise and Marine Scotland (2017).

Almost all Scottish production of finfish and shellfish is in the Highlands and Islands, with processing and supply chain employment (including feed supply, pharmaceutical services, sea and road transport and equipment suppliers) also important to different parts of the region, as well as to other specific places in the Central Belt and the North East of Scotland.

Engagement.

Mowi Scotland's farming operations are headquartered in Fort William, in The Highland Council local authority area. As a prominent business in the aquaculture sector, Mowi first engaged with SAIC during Phase 1 in 2014 and remains active with the centre, engaging with SAIC in a number of ways, via various Mowi farming and support teams, including:

- Multiple collaborative projects.
- Postgraduate placements.
- Event participation.
- Accessing advice or signposting.
- Participating in training and skills development activities.

Market failure rationale.

In terms of barriers to innovation activities before working with SAIC two areas were highlighted by Mowi: direct innovation costs being too high; and availability of finance, including awareness of funding opportunities. In addition, it was noted "day to day core business activities limits involvement in innovation projects and therefore time has to be allocated appropriately to match business needs". In general, key constraints were viewed as capacity to undertake the projects in questions given the diverse skills required and the nature of the technical challenges as well as constraints on funding to be able to contribute to the range of projects that have been addressed.

Collaborative projects.

Mowi has acted as lead partner on eight projects, and has contributed to some 22 projects with SAIC backing, with a total value of £21.6 million (ranging from £30k to £7.6 million), of which the SAIC contribution was £4.7m (ranging from £5k to £923k). A key role for SAIC was identified as their "coordinating role" and contribution to forging useful links between Mowi and other relevant individuals and institutions (some of these connections have also led to activities outside of directly SAIC-related projects). Further, "partnership working and building relationships has been key" in developing successful collaborative projects, a role which Mowi note they could not have taken on themselves.

In terms of university engagement, Mowi has engaged with a wide range of higher education institutions (10) including: Abertay University, Heriot Watt University, Scotland's Rural College, University of Aberdeen, University of Dundee, University of Glasgow, University of the Highlands & Islands (including UHI North Highland, UHI Inverness, UHI West Highland, SAMS UHI), University of Stirling (institute of Aquaculture), University of Strathclyde and University of West of Scotland). The University of Stirling acted as academic lead on nine of the collaborative projects. Mowi has not worked with any other college than Scotland's Rural College, in the context of SAIC related activities.

The nature of the collaborative projects is indicated below, for the largest three by value:

- Scaling up production and implementation of farmed cleaner fish in the Scottish salmon industry (£7.6 million).
- Securing a sustainable supply and the optimal deployment of lumpsucker for sea lice control in the Scottish salmon industry (£3.4 million).
- To identify actions and measures that can be used to prevent or reduce gill disease in farmed salmon (£2.4 million).

Innovation benefits.

The main project facilitated by SAIC, that was considered in detail for the purposes of this report, was MeioMetBar, DNA-based seabed monitoring, and successor projects. The project included a partnership between SAMS-UHI, RLI-UHI, MOWI Scotland and SEPA, funded by SAIC, to develop an alternative, more effective monitoring approach of environmental standards (providing a less technically complex, time consuming and expensive process). Mowi indicate that at inception the project was at TRL 2 (Technology concept formulated), SAIC involvement started at TRL 4, and is now at TRL 7 (Demonstration system) and informing forthcoming regulatory change. It is anticipated that within three years the project will be at TRL 8 (commercially ready). SAIC's role in advancing the TRL is considered 'very important'.

Key areas of the company's innovation investment since working with SAIC have included 'Internal Research & Development', 'Acquisition of Research & Development', and 'Acquisition of machinery and equipment, computer hardware and software for innovation', with SAIC identified as playing a significant role in the first of these. This work has led to 'new or significantly improved services', with SAIC identified as having played a significant role in these introductions.

More generally, a range of significant networking benefits was identified by Mowi from their engagement with SAIC, including the number of business, academic, public sector and third sector contacts, as well as the development of a project or joint venture with an academic institution. SAIC is also noted by Mowi to have played a significant role in supporting the company's relationship with a range of bodies including:

- Suppliers of equipment, materials, services, or software.
- Clients or customers from the private sector.
- Competitors or other businesses in your industry.
- Universities or colleges.
- Government or public research institutes.
- Professional and industry associations.

A number of significant knowledge benefits stemming from SAIC supported activity are also highlighted, including 'Improved awareness of academic capabilities', 'Improved cross-industry collaboration' and 'influencing regulatory change with respect to seabed monitoring at fish farms'.

Wider benefits

For Mowi, a key wide benefit of the research undertaken has been their potential influence on the regulatory environment, particularly as it relates to monitoring of the fish farm environment and the modernising of techniques. Generally, SAIC has been viewed as a significant source of support for Mowi in the following ways:

- Acting as a source of sector or technology expertise.
- Supporting improved visibility within sector/ technology area.
- Supporting diffusion of knowledge and good practices.
- Supporting the development of trust between them and other organisations in their sector/technology area.
- Supporting the sharing of common resources (e.g., joint infrastructure, initiatives for skilled labour development, procurement expertise, support for specialist service providers).

SAICs wider contribution to the innovation ecosystem is also highlighted with regard to :

- Acting as a strategy partner
- Fostering synergies and networking within sector or technology area.
- Raising the profile of the sector/technology area within Scotland.
- Promoting investment and leverage of resources into the sector/ technology area from within Scotland.

- Supporting knowledge development and dissemination
- Encouraging experimentation and commercialisation in Scotland.

Considering wider benefits flowing from SAIC supported work, Mowi notes that they have made a significant contribution to the following UN Sustainable Development Goals (SDGs), as a result of working with the Innovation Centre:

- Zero hunger (e.g., improved food security, nutrition and sustainable agriculture).
- Gender equality (e.g., empowering women and girls).
- Decent work and economic growth (e.g., creating employment opportunities and improving productivity).
- Industry, innovation and infrastructure (e.g., adoption of new medium-high, and high technologies).
- Climate action (e.g., reducing CO₂ emissions).
- Life below water (e.g., conservation and sustainable use of marine resources).

In particular, Mowi notes improved understanding of the interactions between fish farming and the marine environment which allows more informed real time decisions on mitigation strategies to reduce impacts and preserve marine ecosystems.

Satisfaction.

Mowi reports satisfaction with all of the SAIC main areas of activity, stating “All projects have been productive partnerships in key areas of aquaculture innovation (operational, environmental and regulatory innovation). SAIC provides the platform to take forward these projects bringing academia, industry and regulators together. Training / skills development (WISA) has been very successful in developing staff and potential industry leaders of the future”.

Impacts and additionality.

Looking at programme impacts, Mowi identified a number of finance benefits (including ‘Cost savings, or more efficient/effective processes’ and ‘improved conditions for health and welfare of farm reared salmon’), but did not attribute specific sales, or employment, or turnover benefit (noting the case study consultee was not close to all the relevant projects). However, it was anticipated that project outcomes would ultimately contribute to commercial benefits in the longer term. Generally, in terms of additionality, a timing benefit is the main advantage identified. Many projects would not have progressed. Mowi states that they would have achieved the same range of benefits at the same scale, but it would have taken longer to achieve them.

Map A. 1 Mowi Locations, Scotland



Source: Mowi

8.3 Case 2. Pulcea.

Pulcea's stated objective is to harness their expertise in marine physics to deliver technical innovation the aquaculture industry. Their initial focus is the farmed salmon sector in Scotland and Norway, where they are working with academic and commercial partners to improve the welfare of farmed fish, thereby enhancing productivity and profitability. Pulcea are based within the University of Stirling's Innovation Park.

Engagement.

Pulcea first engaged with SAIC during Phase 1 in 2015, and established as a business following a SAIC event at the University of Dundee, and remains active with the centre, engaging with SAIC in a number of ways including:

- Four collaborative projects.
- Attended conferences or events provided by, or supported by, an Innovation Centre (including 'innovation clusters').
- Other advice or signposting provided by an Innovation Centre for any purpose (including accessing third-party funding).
- Joined the membership of SAIC.
- Business development support.

SAIC were identified as instrumental in the formation and development of the business and Pulcea were among the beneficiaries from SAIC's rapid call for ambitious, collaborative proposals aligned with Scotland's Farmed Fish Health Framework. Proposals were encouraged for innovation projects that would deliver broad benefits to the Scottish industry. The rapid response approach, and associated relatively low levels of funding (less than £100k), was considered by Pulcea to be a very powerful tool in lowering entry barriers for new-starts.

Support for collaboration.

Pulcea's four collaborative projects part funded by SAIC, include:

- Ultrasound based technology for salmon delousing.
- EIT Food Breeze - Sea lice treatment with H₂O₂ and acoustic-based mixing technology. EIT Food is an initiative supported by the European Institute of Innovation & Technology (EIT).
- Risk factors for escalating saprolegniosis outbreaks in salmon farms (RIFE-SOS).
- Optibath.

These four projects have a combined total value of £2.5 million (ranging from £76k to £1.1 million), with £250k contributed by SAIC (ranging from £36k to £125k). A number of these projects have multiple commercial partners. For instance, Pulcea joined the OptiBath Consortium with commercial partners Loch Duart and Nevis Marine to work along with the Institute of Aquaculture at Stirling University, as well as with the Institute of Marine Research in Norway (reflecting the international nature of the project partnership).

It was also noted by Pulcea that signposting activity by SAIC and non-financial support (especially administrative guidance) was very important in securing an Innovate UK award of £189,878 over a three year period, supporting the offering of a Knowledge Transfer Partnership (KTP) position in collaboration with Stirling University's Institute of Aquaculture. It is noted that the partnership was recognised as 'outstanding' by Innovate UK²¹.

Market failure rationale.

In terms of barriers to innovation activities before working with SAIC one area was highlighted by Pulcea, and SAIC was identified as significant in overcoming this barrier, that is, the core issue of lack of access to academic expertise or other partnership opportunities. The SAIC role in facilitating engagement with academics was highly valued, and SAIC is noted to have "unblocked the route to

academics". In terms of university engagement, the company has engaged with three institutions including the Universities of Aberdeen, Dundee and Stirling (lead on two projects). Pulcea has not worked with a college in the context of SAIC related activities.

Satisfaction.

Overall, Pulcea reported satisfaction with the majority of SAIC related engagement activities. 'Business development support' was rated 'neither satisfied nor dissatisfied' and this reflects a period of turnover in SAIC staffing, which subsequently stabilised.

Innovation benefits.

Considering the largest project facilitated by SAIC, Pulcea indicate that at inception the project was at TRL 1 (Basic principles observed. Can describe the need(s) but have no evidence), SAIC involvement commenced at TRL4, and is now completed and at TRL 8 (commercially ready. System complete and qualified. All technical process and systems to support commercial activity in ready state). SAIC's role in advancing the TRL is considered 'very important'.

In terms of facilitating links within the sector, SAIC is noted to have played a significant role in supporting Pulcea's relationship with a range of bodies including 'Universities or colleges', 'Government or public research institutes' and 'Conferences, trade fairs or exhibitions'. In addition, a limited range of networking benefits was identified by Pulcea, including, particularly, an increased number of academic contacts. It was commented that further networking events for SAIC members would be welcomed and that these offered genuine opportunities to learn from "like-minded" people in the field.

Key areas of the company's innovation investment since working with SAIC have included 'Internal Research & Development', 'Acquisition of machinery and equipment, computer hardware and software for innovation'; 'Acquisition of existing knowledge' and 'Market introductions of innovation', with SAIC identified as having played a particularly significant role in internal R&D.

This work has led to new or significantly improved services, as well as new patents granted, with SAIC identified as having played a significant role in the latter. A number of knowledge benefits are also highlighted, including: improved market understanding of priority technology areas in their sector; improved awareness of other public sector support; and improved awareness of academic capabilities.

Wider benefits.

More generally SAIC has been viewed as a significant source of support for Pulcea in the following ways: acting as a source of sector or technology expertise; and supporting the development of trust between their organisation and other organisations in their sector/technology area.

SAICs wider contribution to the innovation ecosystem was also highlighted by Pulcea with regard to :

- Providing strategic leadership for the sector or technology area.
- Acting as a strategy partner.
- Fostering synergies and networking within their sector.
- Promoting investment and leverage of resources into the sector/ technology area from within Scotland.
- Promoting investment and leverage of resources into the sector/ technology area from outside Scotland.

Considering wider benefits flowing from SAIC supported work, Pulcea notes that they have made a significant contribution to a number of UN Sustainable Development Goals (SDGs), as a result of working with the Innovation Centre, including: 'Zero hunger' (e.g., improved food security, nutrition and sustainable agriculture) and 'Industry, innovation and infrastructure' (e.g., adoption of new medium-high, and high technologies). In particular, Pulcea notes development of a new method of treating marine ectoparasites of farmed salmon, as having wider benefits for these thematic areas.

Impacts and additionality.

Looking at programme impacts, Pulcea has identified a number of finance and sales benefits, including securing new public sector investment, as well as entering or growing in the Scottish market. However, the current year is viewed as a key one for the business, where they are looking to capitalise on progress to date, and employment is forecast to grow from one employee to five by financial year ending 2025. In terms of additionality, Pulcea states that they would not have achieved any benefits if the Innovation Centre did not exist (that is, absolute additionality).

8.4 Case 3. Moredun Research Institute.

The Moredun Research Institute (Midlothian) (part of the wider Moredun Group) works closely with farmers and vets to improve livestock health and support sustainable agriculture through the development of diagnostic tests and the creation of novel vaccines to combat infectious disease. Moredun's science also helps find solutions to other major challenges such as ensuring safe and sustainable food and water supplies. Moredun is part of a collaborative group of Scottish Research Institutes (SEFARI – Scottish Environment, Food and Agriculture Research Institutes) that receive funding from the Scottish Government to conduct research relevant to policy involving agriculture, the environment, food security, biodiversity, climate change, disease prevention and control and health and well-being.

Engagement.

The Moredun Group first engaged with SAIC during Phase 1 in 2014, and remains active with the centre, engaging with SAIC in a number of ways including:

- Five collaborative projects.
- Attendance at conferences or events provided by, or supported by SAIC.
- Joined the membership of SAIC.

It is also noted that the Moredun CEO chaired the SAIC independent scientific panel and sat as a board member.

Support for collaboration.

Moredun's five collaborative projects part funded by SAIC, include:

- CGD- To identify actions and measures that can be used to prevent or reduce gill disease in farmed salmon.
- CMS- Assessing the use of cardiac biomarkers as a health management tool for early diagnostic of cardiomyopathy syndrome (CMS) in Atlantic salmon.
- Sea Lice vaccine- Development of a novel sea lice vaccine targeting mucosal immunity.
- CMS2- Use of serum biomarkers for early differential diagnostics of cardiomyopathies of Atlantic salmon: field challenge assessment.
- Cure4Aqua- Curing EU aquaculture by co-creating health and welfare innovations.

These five projects have a combined total value of £8.0 million (ranging from £240k to £4.2 million), with £1.5 million contributed by SAIC (ranging from £12.5k (in kind) to £925k). Moredun Research Institute is the lead academic partner on one of these projects, the Cure4Aqua project (£4.2 million value), with one industry partner and eight other academic partners including the University of Aberdeen and seven other overseas higher education institutes and research centres.

A number of these projects have multiple commercial partners. For instance, the CGD project has seven industry partners alongside Moredun Research Institute, Scotland's Rural College and the University of Glasgow.

Market failure rationale.

In terms of barriers to innovation activities before working with SAIC several areas were highlighted by Moredun, and SAIC was identified as significant in overcoming these barriers, that is, 'availability of finance, including awareness of funding opportunities'; 'lack of information on markets'; and 'perceived uncertain demand for innovative goods or services'.

The "convening role" of SAIC was highlighted as particularly important, particularly in bringing industry and policy makers together.

In terms of university engagement, via SAIC supported projects, the institute has engaged with five other Scottish institutions including the Universities of Aberdeen, Edinburgh, Glasgow and Stirling, alongside Scotland's Rural College.

Satisfaction.

Overall, Moredun reported satisfaction with the SAIC related engagement activities. They comment, "Professional organisation, excellent staff, provide opportunities for research projects which other funders don't, clear focus on Scottish aquaculture"... and that "SAIC is a great example of public private investment. Funding of research and development projects is key". In addition, "Project Officers at SAIC are extremely helpful and very effective at managing projects", and that "projects worked well", with "useful outputs, that progressed R&D". It was noted that external funding rules complicated project funding directly by SAIC, but that this was a wider issue and not specific to SAIC.

Innovation benefits.

Key areas of the organisation's innovation investment since working with SAIC have included 'acquisition of research & development', 'design activity, including participatory co-design', and 'market introductions of innovation', with SAIC identified as having played a significant role in all of these.

This work has led to new or significantly improved services, goods and process, with SAIC also identified as having played a significant role in all three. The institute has also undertaken a 'new start-up or spin out business', but SAIC was not credited as significant in this particular activity.

An array of knowledge benefits are also highlighted, including: 'improved market understanding of priority technology areas in their sector'; 'improved technical understanding of priority technology areas in their sector', 'improved understanding of growing the business', 'improved awareness of other public sector support', 'improved awareness of academic capabilities', 'improved awareness of private sector support', 'improved cross-industry collaboration', and 'improved industry or technology foresighting'.

Considering the most significant project facilitated by SAIC, Moredun indicate that at inception the project was at TRL 1 (Basic principles observed), and is now at TRL 2 (Technology concept formulated) and is anticipated to be at TRL 3 within the next three years (Experimental proof of concept). SAIC's role in advancing the TRL is considered 'very important'.³⁸

In terms of facilitating links within the sector, SAIC is noted to have played a significant role in supporting Moredun's relationship with a range of bodies including 'Clients or customers from the private sector', 'Other clients or customers from the public sector', 'Competitors or other businesses in their industry', 'Government or public research institutes', 'Professional and industry associations', and in relation to 'Technical, industry or service standards'.

In addition, a limited range of networking benefits was identified by Moredun, including, an increased number of public sector and business contacts, as well as the development of a project or joint venture with a public body.

³⁸ It is noted SAIC typically funds TRL 4 or above.

Wider benefits.

More generally SAIC has been viewed as a significant source of support for Moredun in a diverse set of wider capacities: 'acting as a source of sector or technology expertise'; 'supporting improved visibility within sector/ technology area', 'supporting diffusion of knowledge and good practices ', 'supporting the development of trust between their organisation and other organisations in their sector/technology area', and 'supporting the sharing of common resources'.

SAICs many wider contributions to the innovation ecosystem was also highlighted by Moredun with regard to:

- Providing strategic leadership for the sector or technology area.
- Effective policy or strategic influence.
- Acting as a strategy partner.
- Fostering synergies and networking within their sector.
- Raising the profile of the sector/technology area within Scotland.
- Promoting investment and leverage of resources into the sector/ technology area from within and outside of Scotland.
- Supporting knowledge development and dissemination.
- Encouraging foreign companies to establish in Scotland.

Considering wider benefits flowing from SAIC supported work, Moredun notes that they have made a significant contribution to a number of UN Sustainable Development Goals (SDGs), as a result of working with SAIC, including: 'Zero hunger', 'Good health and wellbeing', 'Quality education ', 'Gender equality', 'Decent work and economic growth', 'Industry, innovation and infrastructure', 'Reduced inequalities', 'Responsible consumption and production', 'Life below water', 'Life on land', and 'Partnerships for the Sustainable Development Goals'.

In particular, in relation to Zero Huger, Moredun notes work around "High quality protein source for multiple communities", and . "Efficient production systems with low GHG emissions", as well as "online meetings, workshops and conferences technology to improve fish welfare and control fish disease".

Impacts and additionality.

Looking at programme impacts, Moredun identifies employment benefits stemming from the SAIC collaboration including five additional employees (academic research posts predominantly of a temporary nature associated with specific project budgets). Employment is forecast to grow from 180 to 195 by financial year ending 2025, with 10 of these new posts attributed to SAIC support. In terms of additionality, Moredun states that they would have achieved a significantly smaller range of benefits and at a reduced scale and it would have taken longer to achieve them (that is, partial additionality).

9 Conclusion

In common with other Innovation Centres (ICs) SAIC was established to bring the expertise and capabilities of Scotland's universities, research institutes, colleges and businesses, to address industry demand led opportunities that support growth of the Scottish economy, and with a focus on reducing the environmental footprint and increasing the economic impact of aquaculture. This evaluation provides strong evidence that SAIC is delivering against this vision and that is it bringing overall benefits to the Scottish economy, and society more generally, through supporting opportunities for industry and academia to work collaboratively.

SAIC is part way through their second phase and, as such, they are continuing to develop and evolve The evidence presented in this evaluation, and highlighted below, shows SAIC is playing a substantial role in building the innovation ecosystem for aquaculture, delivering innovation outcomes and impacts for the private sector, and in some cases, public sector organisations. The conclusions below are structured around the seven main evaluation objectives.

Assessing the extent to which ICs have delivered routes to economic benefit through increased levels of collaboration between industry and academia.

SAIC has supported a considerable amount of collaborative project activity between academia and industry, and this is translating into economic and wider benefits for Scotland. At least 83 new or completed collaborative projects have been supported, which have generated *at least* 42 commercial launches and other applications of innovation. Since working with SAIC some 49% of clients have introduced new or significantly improved goods, services, or processes and some 45% significantly attribute these introductions to SAIC.

The evaluation illustrates a range of intermediate benefits to clients, students and wider stakeholders. These generally include lowering the barriers to industry-academic interaction through convening and networking activities, as well as direct and indirect funding support, leading to increased or enhanced innovation investment and activity.

Through collaborative projects, SAIC is supporting progression through project Technology Readiness Levels (TRLs): some 63% of clients thought SAIC was 'very' or 'extremely important' in advancing their project TRL. This is positive and indicative of movement from basic research and proof of concept, through prototyping to demonstration and commercial readiness. In common with other ICs the relatively low starting TRL reported by many clients does indicate the basic research nature of many projects; it is likely that more commercial benefits would be realised if projects were already more advanced in terms of TRL at the point of IC support.

A main message from the wider evaluation analysis is that intensity of engagement matters. For SAIC, the importance of cultivation of long term academic-industry collaborative partnerships was something that came out strongly from stakeholder consultation and the client survey.

Assessing the role each IC has played in supporting colleges and universities to maximise their value to Scotland.

The evaluation demonstrates extensive collaboration between industry (primarily private industry in the case of SAIC) and academia. SAIC has encouraged the utilisation of academic expertise across the spectrum of higher education institutions (HEIs). In contrast to Phase 1, the representation of HEIs has diversified and spread beyond the host institution of Stirling University, which was generally more prominent in Phase 1 (although still remains a key collaborative project partner for SAIC, given as highlighted by the client survey).

As for other ICs, college engagement remains the exception rather than the rule, and there is much scope to further utilise their expertise and resources for the collaborative research, networking, and skills development (building on examples of college engagement including digital skills training for aquaculture sector employees delivered by Inverness College, and the 'Future Innovators' online masterclass for the Scottish college sector).

SAIC has provided a moderate level of skills development support (in terms of numbers) in the form of support to students, with a particular focus on those studying for master's degrees, and the ICs' support is typically well regarded in this respect. Students play a positive role in knowledge development and engagement with industry. Whilst relatively few SAIC students attribute their employment wholly to IC support, many go on to enter employment in fields associated with their area of study, especially in the private sector.

The success of SAIC should be acknowledged in significantly mobilising private sector finance for collaborative projects thereby helping universities maximise their value to Scotland.

Examining performance against targets and achievement of objectives.

SAIC has performed well against targets, and in the great majority of cases is ahead of, or on target. As for all ICs, the value of some of the targets could be enhanced. For example, gross forecast

employment or turnover benefits that do not include any routine assessment of IC additionality are of more limited value. Targets are at times well exceeded, and it is noted that SAIC have put in place stretching targets, in order to challenge and drive performance, the exception is skills development activities that have been negatively impacted by the Covid-19 pandemic reducing placement possibilities and by Brexit reducing external funding and international students.

Where net additional impacts are examined in terms of net employment and net Gross Value Added (GVA), then, within the limits of the evaluation, these are very positive. As such, the programme demonstrates progress over Phase 1, where it was harder to identify such benefits coming on stream. Forecast employment and GVA benefits suggest a dip in anticipated performance emphasising the challenging economic environment in which ICs operate, and an imperative for public sector support to sustain innovation investment and collaboration in the sector.

Exploring how effectively each IC builds engagement with the innovation ecosystem.

There is strong evidence that SAIC is engaging with and building the aquaculture innovation ecosystem. The IC has supported *at least* 209 events across Phases 1 and 2 (although more moderate signposting from collaborative projects to other funding bodies is noted in the MEF), and has expanded consortium membership significantly.

In common with other ICs, SAIC's approach has evolved between Phase 1 and the start of Phase 2, building upon stakeholder networks to broaden engagement from a smaller number of large collaborative projects with major suppliers to include a larger number of SMEs and the wider aquaculture supply chain in particular. Although the number of SMEs involved in collaborative projects remain relatively small, the proportion of SME membership has expanded.

Widening of the focus in Phase 2 to include more SMEs and the wider supply chain also provides a stronger market failure justification, and the equity rationale is particularly strong in relation to the sector's rural dimension. SAIC have worked across Scotland and have explicitly engaged with HIE area projects and clients in a proportionate manner.

SAIC is developing ecosystem strengths across the dimensions examined including leadership, influence, partnership building and system strengthening and building system resources in term of visibility, knowledge and commercialisation. Although SAIC has been active in building the ecosystem beyond Scotland, the IC acknowledges more can be done to build international links and presence.

Identifying wider impacts learned.

As well as building and strengthening the innovation ecosystems described above, SAIC is contributing to wider societal goals. The collaborative projects supported by SAIC, as well as the networking and skills activities, are associated with a range of wider benefits, primarily in the areas of conservation and sustainable use of marine resources.

Given the approach of SAIC, collaborative projects are strongly industry-led, therefore scope for wider benefits in terms of public service delivery are more limited. Nonetheless, there is evidence of a number of wider benefits from SAIC's activities, including the wider relevance of the research supported for aquaculture good practice beyond Scotland, the environment and sustainable development in general.

Assessing the degree to which IC benefits have reached all parts of Scotland.

Universities across Scotland are engaged with the SAIC and collaborative projects between academics and SAIC clients are brought forward across a widening range of aquaculture sector interests. The aquaculture sector has a strong base in the Highlands and Islands and a potentially important contribution to make to rural development In this regard, 18% of SAIC consortium network members are HIE area based as are 26% of project partners.

It is noted that there are pockets of Scotland where networking benefits are lower, typically although not always further away from the central belt, which shows the value of a local presence, especially in

Highlands and Islands. This emphasis outreach and an 'on-the-ground' presence can be effective in spreading the reach of IC activity and impact.

Lessons learned.

SAIC delivery over Phase 1 and to date in Phase 2 has become more refined, with lessons learned from Phase 1 being applied in the course of Phase 2. The IC is maintaining levels of activity, with less core funding resource, in part through a high level of leverage of public and private resources.

As was recognised in Phase 1, there is an ongoing challenge to extend the reach and benefits of SAIC further into the SME base and supplier base. This has seen progress in expanding SME consortium membership, and to a lesser extent SME collaborative project engagement.

A strong customer relationship management (CRM) system and a culture of evaluation has supported management decision making in SAIC and helped to support relationship building amongst consortium network members (supporting deepening and strengthening of the innovation ecosystem).

The use of independent advisory panel has been effective in raising the quality of supported projects. SAIC's independent scientific panel appears to be a good model in bringing independence to project approval.