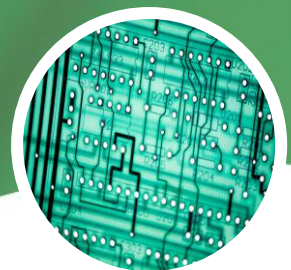


Evaluation of Scottish Stem Cell Network (SSCN)

Final Report to Scottish Enterprise

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1 EXECUTIVE SUMMARY

Background and Study Aims

1.1 Stem cells and regenerative medicine, a field that is largely at the pre-commercialisation stage is predicted to grow to \$35 billion in 2018 from \$8 billion in 2010.¹ Scotland is one of the world's leading locations for stem cell research and the Scottish Government, keen to translate this expertise into applied medicine and practice, has invested £100 million since 2004² in various interventions to support this aspiration. This includes establishing the Scottish Stem Cells Network (SSCN) in 2003 and providing ten-year funding for its operation. The Network aims to bring together scientists, clinicians, industry representatives and other stakeholders as an integrated stem cell community.

1.2 As funding for the core activities of the SSCN ends in December 2012, Scottish Enterprise commissioned an evaluation to review the role, performance and economic impact of the SSCN over the period 2005–2011. A further aim of the evaluation was to assess the degree to which there remains a need for the SSCN to continue and, if so, explore the funding options available.

1.3 To address the evaluation objectives, the study used a combination of primary and secondary research methods. Over 50 qualitative interviews were undertaken with members of the SSCN, the Executive Team and wider stakeholders. Interviews were augmented with an online survey of the entire SSCN membership. Responses were received from 129 members, representing a response of 11%.

Study Conclusions

1.4 The study conclusions are structured to address the evaluation objectives in chapter two at Box 2.1. In summary, these are:

- **Strategic Fit** – The SSCN has been and remains well aligned with the Government Economic Strategy, successive Business Plans of Scottish Enterprise, and is an important contributor to the Life Sciences strategy.

Whilst the SSCN is not the only networking initiative to support the stem cell and regenerative medicine sector, mapping work undertaken by this study suggests that there is more complementarity between SSCN and other networks than there is duplication.

- **Market Failure** – The SSCN was established to address to key market failures: information deficiencies and sectoral fragmentation. In the main, it has been able to overcome these, although there remains a strong rationale for a network, such as the SSCN, to continue to facilitate an exchange of information between the stem cell community. There is also a high risk that, should the SSCN cease to exist post December 2012, the sector would lose the cohesiveness that it has worked hard to foster.
- **Activities and their Appropriateness** – The role of the SSCN has evolved and it undertakes an extensive array of activities in four key areas (providing networking opportunities, supporting the translation and commercialisation of stem cell research, promoting Scottish capabilities internationally, and education and skills development).

¹ Tissue Engineering, Cell Therapy and Transplantation: Products, Technologies & Market Opportunities, Worldwide, 2009-2018

² <http://www.sdi.co.uk/sectors/life-sciences/sub-sectors/stem-cell-research/strengths.aspx>

It is able to do so because it assumes a leadership role and draws on the expertise of both its membership and parts to help deliver projects. At this point, it is difficult to identify another organisation that would perform such a function.

- **Sector Development and Wider Outcomes** – There are several ways in which the SSCN has contributed to the development of the stem cell and regenerative medicine sector:
 - It has saved members time and money by facilitating connections between them, or with external partners.
 - It has enhanced understanding between the research base and industry, helping address one of the perennial barriers to commercialising scientific research.
 - Working with Scottish Development International (SDI), it has been highly effective in promoting Scotland's capabilities in the stem cell field internationally.
 - It is helping address the skills gaps facing the sector, helping to safeguard its future potential.
- **Value for Money** – The SSCN has received £1.76m from Scottish Enterprise since 2003 and raised a further £1.14 million from external sources. The additional funding has all been deployed on activities in Scotland. The SSCN constantly seeks to make the best use of public funding and offer maximum value for money by adapting materials and resources it has developed for one project and using them for another and working efficiently with other organisations to achieve its aims.
- **Economic Impact** – It is estimated that the SSCN:
 - Will generate at least £1.80m in direct net additional sales amongst businesses supported by the Network from the activities undertaken to date;
 - Will have secured additional research income for Scotland, valued at £7.5 million net.
 - Has and will generate £3.53m in net wages GVA as a result of additional research income attracted to Scotland, based on the Scottish Enterprise investment;
 - Taking impacts from sales, joint ventures and research income, 37.64 net FTE jobs have and are expected to be created/safeguarded as a result of the Scottish Enterprise investment in the SSCN. This equates to an estimated net cost per job of £42,508.
- **Future Funding** – Different mechanisms for raising finance have been explored by the Network's Executive Team, which concluded that the SSCN cannot exist without a core level of public sector funding. Whilst some form of core funding remains likely particularly in the short-term, it should continue to supplement this with funding from the private sector, members and external sources.
- **Lessons** – The following have been identified as some areas where the SSCN could seek to strengthen its role and support:
 - There is an opportunity to maximise the full potential of the Advisory Group. It should assume a greater role in decision-making and seek to influence LiSAB and Scottish ministers responsible for the Life Sciences.
 - The SSCN should seek to continue to increase its membership base, particularly with regards to extending this to sectors beyond biology, notably engineering or chemistry.

- The SSCN must remain aware that it should provide support that is not readily accessed elsewhere.

Summary Conclusion

1.5 At this point in time, Scotland is regarded as one of the leading locations in the world for stem cell research and has a competitive advantage that few other countries yet have. However, there is little doubt that global competition is intensifying as each country seeks to secure both the economic and health benefits of stem cell research. In light of this and given the contribution of the SSCN to the development of the sector, it would be unwise for it to cease to exist in December 2012. Such a scenario would undermine the investment made by Scottish Enterprise to date, both in the SSCN and related infrastructure.

Study Recommendations

- 1.6 The following recommendations are made by the study:
1. The SSCN should continue to operate post December 2012, but this will require a core level of public funding.
 2. The SSCN should continue to find ways of supplementing public funding, including adopting a more commercial approach with regards to charging for events.
 3. The SSCN should continue to seek to broaden its membership, particularly its business member base, to create a greater pool of potential contributors of private sector finance.
 4. The SSCN should actively seek to secure increased membership from related disciplines, for example engineering and chemistry, and promote knowledge transfer and collaborative activity cross-discipline.
 5. With a new Chair appointed to the SSCN, it should take the opportunity to refresh its strategy.
 6. Consideration should be given to reducing the size of the Advisory Group and giving it a greater role in decision making.
 7. The advantages and disadvantages of assuming a charitable status should be explored once more in order to allow some fundraising activities that are currently not an option for the Network.
 8. This discussion should be held in light of the strategic direction of SSCN which should not lose sight of its key role in promoting practical moves towards the commercialisation of stem cell regenerative medicine.

2 INTRODUCTION

2.1 Scotland has played a leading role in the research field and in translating this expertise into applied medicine and practice. It has the second largest life science cluster in the UK and its 600+ organisations create Gross Value Added (GVA) of £1.4 billion annually. Within this, Scotland has world-leading expertise in the field of stem cells and regenerative medicine. The strength of the Scottish stem cell sector is, in part, due to the investment made by the Scottish Government to facilitate its development along with the wider support afforded to it. Given that the market for regenerative medicine products and therapies is predicted to grow to \$35 billion in 2018 from \$8 billion in 2010,³ there is considerable opportunity for Scotland to benefit economically from the expertise and capabilities that exists here.

2.2 The Scottish Government, working through Scottish Enterprise has invested in infrastructure, facilities and a wide range of collaboration and commercialisation activities within the stem cell field. These activities, taking place under the *Stem Cell Intervention Framework* (SCIF; see page 16), include the creation of the Scottish Stem Cell Network (SSCN) in 2003 and providing ten-year funding for its operation. In many ways, the Network is the over-arching body for the other interventions supporting the stem cell sector: it aims to bring together scientists, clinicians, industry representatives and other stakeholders as an integrated stem cell community and one of the primary effects of this will be to help improve the rate at which laboratory research translates into therapeutic benefits for patients.

2.3 The current ten-year funding model used by Scottish Enterprise to finance the core activities of the SSCN will end in December 2012. In light of this, together with the constraints on public spending, and the ongoing need for Scottish Enterprise to demonstrate the economic impact being achieved in return for public sector investment, Scottish Enterprise commissioned GEN to undertake an evaluation of the SSCN. This took place over a three-month period between September and December 2011. This report brings together the findings of the evaluation.

Evaluation Objectives

2.4 The evaluation has been designed to review the role, performance and economic impact of the SSCN over the period 2005–2011. The overarching aims of the evaluation are to assess the validity of the original market failure that provided a rationale for establishing the SSCN; to examine the extent to which the SSCN has met its targets; and calculate the Gross Value Added (GVA) that has occurred from its activities to date and how much can be expected in future. A further aim of the evaluation is to consider the future of the SSCN, in terms of whether there remains a need for its operation and, if so, its role and the funding options available. A detailed list of evaluation objectives is set out in Box 2.1.

³ Tissue Engineering, Cell Therapy and Transplantation: Products, Technologies & Market Opportunities, Worldwide, 2009-2018

Box 2.1: Evaluation Objectives

- The extent to which SSCN's activities "fit" with the priorities set out in the relevant sections of the Government Economic Strategy, Scottish Enterprise's Business Plan and the Life Sciences Strategy;
- The validity of the original market failure justification for SSCN, the extent to which it is considered there are market failures that justify continuing intervention by Scottish Enterprise in this area and the evidence that SSCN has impacted (in whatever way) upon this failure;
- The relationship of SSCN to other stem cell activities including those in the Stem Cell Intervention Framework, other networks (especially those in England) and other related activities in Scotland, for example Nexus. This mapping exercise should then consider the extent to which there are synergies, overlap and duplication of activities and the extent to which these could be capitalised upon or overcome as appropriate;
- The extent to which the targets set in the 2005 approval paper have been met, analysis of variance from these and an explanation of why these variances have occurred;
- The views of members and stakeholders on the services provided and any gaps in these;
- Views on management, direction and strategy of the Network;
- Views on the future of the Network, given that Scottish Enterprise's funding ends in 2012. This should consider other funding options such as membership fees, industry sponsorship and grant and charitable funding. Some of these are outlined in the 2010 internal review;
- An analysis of outputs and outcomes to date, both as indicated by the targets and any unanticipated effects, for example spillovers into academia and industry;
- An assessment of the economic impact of the Network to date in terms of GVA, jobs, exports and other metrics that seem relevant in the light of identified achievements. As appropriate attempts should also be made to identify anticipated future impacts. GVA impacts should be presented in Scottish Enterprise's required format;
- Recommendations, based upon the identified evidence, for SSCN's future, covering such things as funding, management, activities and linkages with other networks and agencies; and
- Key transferable learning points that could be of relevance to other Life Science and networking activities that Scottish Enterprise might want to support or play a role in.

Research Methods

2.5 The study used the following research methods to address the evaluation objectives:

- **Documentary analysis** comprising a review of SSCN literature to understand its aims, objectives, rationale, and key activities. The study team also reviewed Scottish life-sciences strategies to help assess the extent to which the activities of the SSCN contribute to their objectives and priorities.
- **Analysis of financial and monitoring information** was undertaken to present a profile of the way in which the SSCN is funded, and the degree to which it has achieved its performance targets.
- **Qualitative interviews** were undertaken with members of the SSCN and its Executive Team. The interviews explored the nature of their interaction with the SSCN and their views on the activities undertaken by the Network. They also explored the way in which members had benefited from the SSCN and the degree to which it has supported the development of the stem cell sector. Importantly, these organisations (and particularly the companies), were selected for in-depth interview because they were most likely to demonstrate commercial and other impacts as a result of their involvement with SSCN. Table 1.1 provides a breakdown of the number of interviews conducted by the respective interest groups that are members of the SSCN.

Respondent Type	No. of Interviews
Companies	13
Academics	7
Policy and Public Outreach	7
Economic Development	6
Educational Training	6
Executive Team and Other	6
Consultants	4
Charities and Patient Groups	2
Total	51

- Online survey of SSCN members.** The Network has 1200 members and an online survey was sent to approximately 1150 of them i.e. the whole Network minus those interviewed above. The survey explored similar themes as the qualitative interviews, focusing on the types of services accessed from the Network, their benefits (including commercial and wider impacts) and the degree to which it is important/necessary for the sector to have an organisation undertaking functions such as those being delivered by the SSCN. The survey generated an 11% response rate with 129 members taking part. The vast majority of them are based in Scotland (86%) with a further 9% located elsewhere in the UK. Table 1.2 provides a breakdown of survey responses by respondent type.

	No.	%
Academic	72	56%
Small or medium sized business	27	21%
Large business	12	9%
A public sector research institute	5	4%
Government	5	4%
NHS/hospital	4	3%
Not for profit organisation	3	0.02
Skipped	1	0.01
Total	129	100%

2.6 The above categories used to distinguish different member types were devised for the online survey. The SSCN does not record its membership in the same way. In broad terms, its membership comprises the following:

- 70–75% from the academic base, which is defined as universities, research institutes and hospital/clinical members;
- 20% from the commercial sector, which includes SMEs, large businesses and charities;
- 5–7% from the general public, including patients.

2.7 The number of responses secured from the commercial sector is representative of its make-up of the overall membership population, although there seems to be an under-representation of responses secured from academics. Overall, however, by combining the

survey responses with the qualitative interviews, the evidence base is broadly representative of the membership as a whole.

Structure of the Report

2.8 The rest of the report is structured as follows:

- **Chapter three** sets out the wider policy context within which SSCN operates. It outlines the market failure that the Network was tasked to address and its aims and objectives.
- **Chapter four** presents an overview of the key activities undertaken by the Network to support the development of the Scottish stem cell sector. These are structured against its core aims and objectives.
- **Chapter five** presents a financial profile of the SSCN and assesses its contractual performance over the period January 2006 to March 2011.
- **Chapter six** draws on the survey results and interview findings to identify the ways in which members have benefited from the work of the SSCN. It also summarises their views about the effectiveness of the Network in promoting Scotland's stem cell capabilities internationally and its public engagement work. The chapter synthesises respondents' views about the degree to which the Network has supported the development of the sector.
- **Chapter seven** quantifies the economic impact of the SSCN.
- **Chapter eight** presents respondents' perceptions about the role and value of the Advisory Group. It also outlines the future role of the Network and the funding options available to the SSCN post December 2012.
- **Chapter nine** sets the SSCN within the wider Scottish and UK stem cell community, and assesses its relationship with international networks. It highlights SSCN's unique selling points and identifies its complementarities with other networks.
- **Chapter ten** presents the study's conclusions.

3 STRATEGIC CONTRIBUTION AND MARKET FAILURE

3.1 This chapter sets out the strategic context within which the SSCN was established and currently operates. The nature of the market failure it was established to address is also outlined. Following on from this, the chapter sets out the aims and objectives of the SSCN. The chapter begins by providing an overview of the stem cell sector.

The Stem Cell Sector

3.2 Certain types of stem cell have the capacity to differentiate into any cell type in the body. In the last ten to fifteen years major breakthroughs have occurred, which have generated widespread academic and commercial interest, particularly given that human embryonic, adult, and more recently induced pluripotent stem cells can now be isolated, grown up, purified and stored cryogenically. These developments are stimulating the emergence of a new industry based on stem cell technology, which encompasses both the pharmaceutical and medical sectors. Regenerative medicine, toxicological screening and drug discovery are examples of a how stem cell technology can be exploited. However, as with many emerging technologies, there are significant technological, regulatory and strategic barriers that need to be overcome to realise the economic and social benefits arising from the stem cell sector.

The UK Stem Cell Sector

3.3 In the UK, significant funding has been allocated to stem cell research and regenerative medicine because of their potential to deliver new treatments for incurable illnesses, like chronic heart disease, diabetes and Parkinson's. Since 2005, much of the public investment in stem cell research in the UK has been informed by the UK Stem Cell Initiative (UKSCI), which was established by the then Labour Government. The UKSCI was a high-level of review, led by Sir John Pattison, of the status of stem cell research in the UK and overseas. Its key remit was to develop a ten-year strategy (2006–2015) for stem cell research that would maintain the UK's position as a world leader in this field and to include the costs associated with implementing the Review's recommendations.⁴

3.4 Indeed, as is the case with emerging technologies, to date, much of the investment in the stem cell sector has been funded by the public and charitable sectors. For example, the third sector invested approximately £38 million in regenerative medicine research between 2005 and 2009, whilst the public sector has made available over £200 million since 2003.⁵ The absence of funding from the private sector is, in part, due to the sector's early stage of commercialising science and technological research, not only in the UK but the world over. Indeed, examining the size and structure of the sector illustrates its nascent status:

- Worldwide, there are only 391 companies operating in regenerative medicine, with the majority based either in North America (47%) or Europe (37%). As an aside, it is noteworthy that the sector is dominated by SMEs. Of the 391 companies 91% are SMEs and only 9% are large pharmaceutical and biotechnology companies.⁶
- To date, there has been limited commercial interest in regenerative medicine across Europe. The UK, Germany and France are the only three countries with any significant commercial activity taking place.

⁴ UK Stem Cell Initiative: Report and Recommendations, November 2005. This can be downloaded from: <http://www.dh.gov.uk/ab/UKSCI/index.htm>

⁵ BIS (2011) *Taking Stock of Regenerative Medicine*. London: HMSO (page 22).

⁶ Regenerative Medicines in Europe Project c.f. BIS (2011) *Taking Stock of Regenerative Medicine*. London: HMSO (page 23).

- Intellectual property protection, which is a useful measure of the stage of development for a particular technology,⁷ shows that regenerative medicine is still at an early phase. Most organisations, regardless of their location around the world, have only filed between 1-5 patent applications to date.⁸ In terms of the total number of patents by country, the UK ranks sixth, behind France, China, Japan, Germany and the USA, which is the global leader.

3.5 There are, however, a number of developments taking place simultaneously that are generating interest in the (academically oriented) research undertaken with a view to exploiting its commercial and public health opportunities. These are:

- The cost of public healthcare is a major issue facing governments across the world, given the need to reduce major budget deficits. Both industry and healthcare professions are beginning to acknowledge that regenerative medicine has the potential to save public health bodies money by reducing the need for long term care for major illnesses and their associative disorders. For instance, the Bioindustry Association has highlighted that, currently, 80% of healthcare costs go towards treating the later stages of illness, but in future, they could either be cured early on or managed better using cell therapies.
- Much of the pharmaceutical sector is facing declining revenue and growth due to a combination of: (i) key revenue producing drugs losing market exclusivity in 2011/12; (ii) high development costs and high failure rates in the drug development process; (iii) challenges in encouraging take up of new products not least because of the need to demonstrate their cost effectiveness and value over existing products to healthcare payers.
- The emergence of stratified medicines and targeted therapies with pharmaceutical companies beginning to develop products tailored for small groups of patients.
- The ageing of the UK's population and the market opportunities presented for regenerative medicine products; the opportunities are likely to be further strengthened given the need for healthcare producers to reduce costs.

⁷ In October 2011 the European Court of Justice ruled that procedures that use embryonic stem cells cannot be patented. The court's ruling, which cannot be appealed and applies to all 27 member states of the European Union (EU), bans patents on procedures that involve the destruction of human embryos at any stage. That includes not only procedures in which embryonic-stem-cell lines are created, but also those that use previously derived cell lines. The judgement has made it impossible to patent research that is lawfully practised in a substantial number of EU states, including research on established cell lines that were ethically obtained with the consent of donors and publicly funded by member states and the EU itself.

Stem cell researchers fear the EU ruling could damage the whole field of research and drive much of it abroad – to America and Asia (<http://www.bbc.co.uk/news/health-15355991>). However, Japan's 2001 guidelines on stem cell research make it extremely difficult to derive new human embryonic stem cell lines and undertake research on both home-grown and imported cell lines. In 2009, the rules were relaxed, although commentators believe that it will still be difficult to get research projects off the ground. (<http://www.nature.com/news/2009/090821/full/4601068a.html>)

There has been significant confusion over federal funding for human embryonic stem cell research (hESC). Whilst the United States as a whole outspends its competitors on stem cell research, there has also been uncertainty around federal funding this following an injunction by the for the District of Columbia in August 2010. The Chief Judge ruled that the National Institute of Healthcare's guidelines were in violation of the Congress' Dickey-Wicker Amendment (which bans research which injures or destroys an embryo). The injunction was made despite an Executive Order issued by President Obama in March 2009, which allowed federal funding of stem cell research on any stem cell line allowed by law. However, in May 2011 a federal appeals panel voted two to one to overturn the ruling given by the District Court of Columbia. Currently this ruling still stands, with Obama's Executive Order allowing federal funding for stem cell research still valid (c.f. BIS 2011, Taking Stock of Regenerative Medicine).

⁸ UK Intellectual Property Office Report c.f. BIS (2011) *Taking Stock of Regenerative Medicine*. London: HMSO;(page 36).

- Large and growing unmet medical conditions that have no therapeutic options and are currently managed palliatively.

3.6 As can be seen, there are powerful drivers encouraging the development of the stem cell sector and regenerative medicine. However, there are also a range of technological, regulatory and strategic issues that need to be overcome before the economic and healthcare opportunities can be fully realised. A fuller discussion of this can be found in a recent report published by BIS *Taking Stock of Regenerative Medicine* (2011),⁹ although it is important to draw attention to the following:

- The need to manufacture viable living cells for regenerative medicine applications poses significant challenges. Achieving a controlled and characterised manufacturing process for cell based therapies requires the development of new technologies, tools and techniques. Without enabling technologies to manufacture, store, transport and distribute products, therapies cannot become mainstream clinical practice.
- Developing a viable, compelling business model is a major issue facing companies with a key decision relating to whether to develop a product or service based offering: in effect designing a 'one-to-many' or a 'one-to-one' approach. Each requires different production, infrastructure, logistics, skills and storage arrangements.
- There is a large gap between funding and investment. Stem cell and regenerative medicine science is an expensive and risky process from the basic science to the patient ready product. The current five to ten year venture capital investment model does not fit well with regenerative medicine and its much longer time to market.¹⁰
- Until widespread safety and efficacy of stem cell products can be demonstrated, big pharma, biotech and medical device companies will continue to have a modest, exploratory interest in regenerative medicine.

3.7 As regenerative medicine has been highlighted as a priority sector by the UK Government, it is helping to support the challenges the sector faces through a range of strategic initiatives, infrastructure, and regulatory support and funding. This includes the Technology Strategy Board's £21.5 million *RegenMed* programme of investment to support the commercialisation of R&D. It also includes plans to fund the development of a Cell Therapy Technology and Innovation Centre.

The Stem Cell Sector in Scotland

3.8 The drivers underpinning the development of the stem cell sector, which have been outlined above, together with the challenges the sector faces in being able to exploit emerging commercial and healthcare opportunities are the same in Scotland as elsewhere in the UK. However, at this point in time, Scotland is regarded as one of the leading destinations in the world for stem cell research and because of this and the £100 million investment made since 2004, Scotland has a competitive advantage that few other countries (yet) have within stem cell and regenerative medicine.¹¹ Evidence of Scotland's competitive advantage include the following:

- **Scientific excellence:** On a global level Scottish stem cell science leads the world. Scotland is:
 - 1st in the world for stem cell research based on citation impact;

⁹ BIS (2011) *Taking Stock of Regenerative Medicine*. London: HMSO.

¹⁰ Indeed, despite the evidence that upfront investment will bring long term savings, there is a reluctance to do so as this is seen as introducing additional costs as opposed to savings.

¹¹ <http://www.sdi.co.uk/sectors/life-sciences/sub-sectors/stem-cell-research/strengths.aspx>

- 4th in the world for clinical medicine research based on citation impact, and;
- has the largest stem cell research cluster in Europe with major centres in Edinburgh, Glasgow, Dundee and Aberdeen.
- **Clinical data, trials and approval:** Scotland has extensive computerised patient data and historical family study data, which support clinical trials being established quickly and monitored effectively. Scotland provides a co-ordinated clinical trials R&D permissions approval process to streamline commercial and non-commercial clinical trials placed in Scotland.¹² Referred to as the PISCES study (Pilot Investigation of Stem Cells in Stroke) or the ReNeuron trial after the company that has devised the therapy, the clinical trial is being conducted at the Institute of Neurological Sciences, Southern General Hospital, Greater Glasgow and Clyde NHS Board. The Principal Investigator for the trial is Professor Keith Muir, Professor of Clinical Imaging at the University of Glasgow. The aim of the clinical trial is to evaluate the safety of the implantation technique and to establish the side effect profile associated with the implantation of ReN001 stem cells in patients who have suffered an ischaemic stroke.¹³
- **Development of a supply chain:** The number of companies operating within the sector has now grown to 26 from only 4 six years ago. Appendix two identifies the companies operating in the sector in Scotland. A supply chain is beginning to form to be able to support the development, manufacture, and trial of regenerative medicine tools and therapies, thereby increasing Scotland's attractiveness as a European location for conducting Phase 1 and Phase II clinical trials.
- **Facilities:** Scotland has world class facilities throughout its major cities. These include Aberdeen's Science and Technology Park, Glasgow's West of Scotland Science Park, Dundee's Medipark, and the Edinburgh BioQuarter. Indeed, BioQuarter is one of the few locations in Europe that offers commercial facilities co-located with a teaching hospital and research University. As well as home to over 1150 researchers from two of the City's medical schools, it comprises: (i) the £58 million MRC Regenerative Medicine Centre and (ii) a £21.9 million BioIncubator.¹⁴

3.9 The above may give the impression that critical mass in Scotland's stem cell sector has emerged. This is not the case. Until recently, Scotland's capability has been largely academic, although the focus is now very much on translational medicine i.e. moving basic research into clinical and commercial applications. Through various activities, such as its

¹² www.NRSPCC.org

¹³ In the Phase I safety study, ReNeuron's ReN001 stem cell therapy is being administered in ascending doses to a total of 12 stroke patients who have been left disabled by an ischaemic stroke, the most common form of the condition. To date, five patients have been treated in the study and ReNeuron expects that all remaining patients in the PISCES clinical trial will be treated over the course of 2012.

The independent Data Safety Monitoring Board (DSMB) for the trial met in October 2011, when it reviewed verified data from the first four patients. No cell-related adverse events have been reported in any of the patients treated to date and neurological and other safety assessments reviewed by the DSMB show no deterioration in the health of any of the patients as a result of the ReN001 treatment.

ReNeuron is planning to seek advice from the UK and other regulatory authorities regarding its clinical development strategy for ReN001, with a view to commencing a Phase II efficacy study in 2013.

Professor Keith Muir will present further data regarding progress with the PISCES clinical trial at the Stroke Association's 6th UK Stroke Forum Conference in Glasgow from 29 November to 1 December 2011. <http://www.reneuron.com/clinical-trials>

¹⁴ The original figures for these facilities were given in \$US in SDI's brochure: *Scotland: Stem Cells and Regenerative Medicine*. At the time of writing, the exchange rate is: \$1 US = £0.64 and the figures quoted in sterling are based on this exchange rate.

events, the SSCN is seeking to support this process. The SSCN's activities complement the Scottish Government's investment in facilities and Scotland's supportive regulatory and commercial environment.

Strategic Context

The Stem Cell Intervention Framework

3.10 In 2003 in order to support the development of the stem cell and regenerative medicine subsector, the Life-sciences Team within Scottish Enterprise developed a strategy for stem cell activity called *Stem Cells in Scotland: A Vision for World Leadership*. The strategy described the overall case for public sector support and highlighted the potential benefits to Scotland's economy of doing so. This led to the *Stem Cell Intervention Framework* (SCIF), the structure within which stem cell and regenerative medicine interventions supported and funded by the Scottish Government have taken place, including the creation of the SSCN.

3.11 The SCIF has recently been updated by Scottish Enterprise and is shown below.

Innovation & Infrastructure		Funding		People		Promotion	
Manufacturing: Roslin Cells Development of critical elements for GMP derivation; realisation of pilot facilities Total - £3.9m (SE) Status - Complete	SCRM Flagship centre for academic, commercial & manufacturing development £14.28m (SE) Total - £59m (SE, UoE, SFC/Govt) Status - Complete	SE Translational Fund Funds translational development of stem cell technology, coinvesting with UKSCF, MRC £5m approved (SE) £2.6m spent Status - Complete	Scottish Stem Cell Network Development and enhancement of the Scottish Stem Cell Network £1.85m (SE) Status - Underway	Highly-targetted "Proposition Marketing" Develop comprehensive, intelligence-led proposition highlighting Scotland's "offer" SE, SDI, SSCN Status - Underway	California Collaboration Conclude formal collaboration agreement with California Institute for Regenerative Medicine SE/SDI Status - Underway		
Manufacturing: Blood Cells Development of technology & processes to manufacture blood from stem cells £450k (SE) Total - £5.2m (SFC, UoG, SNBTS, SE) Status - Underway	Manufacturing: ITI Stem Cells Prog Aim: to produce high-quality human stem cells for use in pharma research £9.5m (SE ITI) Status - Complete	UK SCF Translational Fund Charitable fund for translational development of stem cell technology £5m (UKSCF) £300k (SE) Status - Underway	"Talent" Programme to attract and retain key "talent" £4m (SFC, UoE) Status - Complete	International Promotion International meetings – BIO, ISSCR International networks SSCN, SE/SDI Status - Underway	International Promotion Attract major high-profile conference (ISSCR) to Scotland in 2015 £340k (SSCN, Glasgow City, VisitScotland) Status - Underway		

3.12 The SCIF has been structured along four themes: infrastructure, funding, people and promotion. Although the SSCN is primarily associated with the 'people' theme, in practice, its activities have operated across all four. The overarching aspiration of the Framework has been to develop a fully functioning industrial subsector, placing Scotland within the top ten locations in the world for carrying out stem cell research and business. It was envisaged that the projects within the Framework will, between them, achieve the following:

- Increase the economic contribution of companies operating in the sector;
- Create an attractive place for life-science graduates and managers to work;
- Increase the level of investment in the sector, including that from the private sector;
- Attract investment from overseas companies;
- Promote and enhance academic success;
- Demonstrate improved connectivity and collaboration within the sector.

3.13 If the above objectives are achieved, the stem cell subsector will become a major part of the life-sciences industry in Scotland.

The Life-Science Strategies

3.14 In 2005 Scottish Enterprise produced the first strategy for the life-sciences sector as a whole. It sought to create a critical mass within the industry, one capable of making a significant contribution to the nation's economic prosperity.¹⁵ Underpinning its development was an acknowledgement that, despite major investment in research, much of the sector's activity remained at the pre-commercialisation stage. Therefore, in order to boost commercial activity, public intervention was required in four areas.¹⁶ The 2005 strategy was refreshed in 2008; it retained a focus on securing critical mass but expanded the main thematic areas of action from four to five.¹⁷

3.15 It is important to acknowledge that the stem cell subsector was identified as a key component of the overall Scottish Life Sciences Strategy and the five themes are as important and relevant to this subsector as they are to others. Particularly relevant is 'collaboration', implicitly acknowledging that fragmentation and a lack of cohesiveness will harm Scotland's ability to compete effectively on the global stage. In turn, this highlights the on-going need for an organisation such as the SSCN.

3.16 Formed in May 2009, the Life Sciences Advisory Board (LiSAB) is a joint industry, enterprise and government strategy team with a very active remit to develop, drive and deliver the Life Sciences strategy in Scotland. It plays a crucial role in ensuring Scotland has the best possible environment for fledgling technologies and established Life Sciences companies alike. LiSAB fosters support and discussion between key players in the Life Sciences sector, and those responsible for government policy-making at the very highest level. LiSAB consists of representatives across the spectrum of the Life Sciences community including CEOs and senior managers from pharmaceutical, biotechnology, medical devices and diagnostics companies, contract research organisations, the research community, the NHS and Scottish Government. The Board comprises representatives across the spectrum of the life science community. It fosters support and discussion between key players in the life sciences sector and those responsible for government policy-making at the very highest level. LiSAB's key remit is to:

¹⁵ Scottish Life Sciences Industry Advisory Group (2005) *Scottish Life Sciences Strategy: Achieving Critical Mass*. Scotland: Life Sciences Industry Advisory Group.

¹⁶ These were:

- (i) **The right people** – ensuring that Scotland creates, attracts and retains scientists, researchers, graduates, as well as experienced managers of technology-led businesses.
- (ii) **The right resources** – investing in Scotland's science base, the commercialisation of research, as well as the physical infrastructure required by business, and ensuring them access to appropriate market information and intelligence.
- (iii) **Focus** – concentrating activity and resources on fully exploiting those opportunities to which Scottish companies and institutions add greatest value.
- (iv) **Collaboration** – combining the effort from all parts of the life sciences community and those who can influence its success, including business, public sector, research base, NHS and general public.

¹⁷ The modified themes were:

- (i) **People** – having the right skill mix, calibre and numbers to meet sectoral employment requirements, based on attracting, retaining and developing talent;
- (ii) **Technology** – an environment conducive to developing the knowledge base and exploiting the transfer of technology between academia and business;
- (iii) **Capital** – access to funding appropriate to organisational needs throughout their growth cycle;
- (iv) **Infrastructure** – having the right facilities and assets to meet the needs of a growing sector
- (v) **Collaboration** – working effectively to connect across organisational boundaries and align resources behind priority areas of strength.

Life Sciences Scotland (2008) *Scottish Life Sciences Strategy 2008: Achieving Critical Mass: 2020 Vision*. Scotland: Life Sciences Scotland.

- set the overall strategy for the growth of the Life Sciences sector in Scotland;
- provide advice to government and the public sector on key issues affecting Life Sciences; and
- help develop a creative environment where ingenuity and innovation can create jobs and wealth for Scotland.

3.17 Whilst the 2020 vision of developing a globally focused, sustainable and collaborative Life-sciences sector in Scotland remains valid, in light of one of the deepest global recessions and its impact on the Scottish economy, the LiSAB reviewed the 2008 strategy and launched a new one in March 2011. As reprinted in Box 3.1, there is now a new mission and vision for the sector, one that seeks to respond to both the economic challenges and the opportunities presented by a whole raft of demographic, environmental and technological factors. Stem cell and regenerative medicine have been identified as leading subsectors with major research strengths needing to be exploited to help double the Life Science sector's contribution to Scotland's Gross Value Added (GVA).

Box 3.1: Scottish Life Sciences Strategy 2011 – Mission, Vision and Approach

The mission: Double the economic contribution made by Scotland's Life Sciences industry by 2020 to £6.2 billion in turnover and £3 billion in Gross Value-Added.

The vision: The Life Sciences industry to be a significant contributor to Scotland's sustainable economic growth and to establish Scotland as the location of choice for Life Sciences businesses.

The strategy: Concentrating efforts on three core areas where the greatest impact can be made toward achieving the 2020 Vision. These are:

- Anchoring those businesses in Scotland that provide vital skills and market access;
- Building more resilient companies and comprehensive supply chains;
- Attracting new inward investment and talent that will build on Scotland's existing capabilities.

The strategy aims to build on Scotland's existing strengths, particularly in key business areas such as medical technologies and pharmaceutical services where there is already a substantial local company base, ranging from innovative start-ups to global multinationals. It also aims to capitalise on prior investment in Scotland's research excellence, including stem cells, and regenerative medicine, clinical/translational medicine where there are significant current and emerging commercial opportunities.

Market Failure

3.18 In August 2002, a group of leading academics and companies met at the request of Scottish Enterprise to discuss the extent to which Scotland had a critical mass of activity in the field of stem cell research, and to identify what could be done to establish it as an internationally renowned location for stem cell research. The group concluded that whilst Scotland has a pre-eminent position, it needed to expand its sectoral activities to secure international competitive advantage. The group identified the following activities that would improve Scotland's reputation in stem cell research:

- Increase awareness of Scotland's capabilities internationally;
- Attract significantly greater research funding from Government and commercial sources;
- Establish infrastructure to support the growth of the stem cell and regenerative medicine sector;

- Attract the best scientists to Scotland and retain them, and develop future talent; and
- Scotland to be able to articulate and discuss the issues/benefits of stem cell work.¹⁸

3.19 In relation to the first two activities listed above, the group decided that the recently formed Edinburgh Stem Cell Network should extend its coverage across Scotland and that a Network Director be appointed to help it do so. In effect, a decision was made to establish the SSCN. It was envisaged that the Network Director would coordinate the Network's activities and, in particular, raise awareness of stem cell research both nationally and internationally.¹⁹

3.20 The underlying premise for establishing the SSCN was (and remains), therefore, to address information deficiencies. As stem cell therapies are yet to be established and remain some way from market, both public understanding and awareness amongst private investors (about the opportunities relating to stem cell research) is lacking.²⁰

3.21 The Network was also created to address the lack of cohesion within the emerging stem cell community²¹ and, in particular, to facilitate collaborative multi-disciplinary teams of academic and clinical scientists in order to exploit the health and commercial benefits of stem cell research. As the group forming the Edinburgh Stem Cell Network²² recognised, one of the challenges facing the sector is that few clinicians have the expertise or facilities to translate pre-clinical laboratory work into the clinical environment. Conversely, academic researchers working on basic problems of stem cell biology of species such as the mouse, often have little understanding of the practical and clinical necessities required for therapeutic intervention.

3.22 The SSCN seeks to address this problem by creating an environment to support collaborative links between research scientists and clinicians in the field, and engaging the private sector in the development of stem cell technology. By supporting the development of the scientific/clinical/industrial interface, it is envisaged that this will increase the rate at which research is translated into therapeutic benefits for patients.

3.23 Whilst the SSCN has largely succeeded in creating a strong, interactive Scottish stem cell community (see chapter six for more details) by encouraging collaborations between universities and between academics and industry, it is essential for Scotland to continue to strengthen such links to support the ongoing development of the sector. Indeed, even as late in 2009, six years after the Network had been established, research by the University of Glasgow²³ highlighted the need to facilitate better relationships between the science base (i.e. academia) and clinical and commercial applications. Put another way, the evidence indicates that there is still a need to overcome barriers to collaboration and the SSCN remains in a preeminent position to facilitate closer interactions between the research base, the NHS and industry. Its work could help Scotland to benefit from the opportunities arising from clinical applications and demand driven commercial developments in health.

¹⁸ Scottish Enterprise Edinburgh and Lothian Biotechnology Team: Item No 10 (v) For Approval. December 2002.

¹⁹ Scottish Enterprise Edinburgh and Lothian Biotechnology Team: Item No 10 (v) For Approval. December 2002.

²⁰ Scottish Enterprise Edinburgh and Lothian Technology Team: Scottish Stem Cell Network – Phase 2. Paper for Approval November 2005.

²¹ Scottish Enterprise Edinburgh and Lothian Technology Team: Scottish Stem Cell Network – Phase 1A: Gate 3: Paper for Approval 16 August 2005.

²² In early 2002, a group of researchers and clinicians from industry and academia together formed the Edinburgh Stem Cell Network. It sought to develop the clinical and scientific interface to enable advances in stem cell biology to be translated as rapidly as possible to the clinic (Scottish Enterprise Edinburgh and Lothian Biotechnology Team: Item No 10 (v) For Approval. December 2002).

²³ C.f. Scottish Government (November 2009) *Life-sciences Key Sector Report*. Scotland (pages 7–8).

Aims and Objectives

3.24 In light of the market failure outlined above, the SSCN was established as a key component of the SCIF with the remit to:

- Facilitate the creation of a Scottish stem cell community and promote collaboration across professional, disciplinary and institutional barriers.
- Identify routes to funding, encourage and assist commercialisation and address the legal, IP and regulatory hurdles that prevent the commercialisation process.
- Promote public engagement addressing ethical and technical issues that could lead to public distrust and popular misconceptions, and over inflation of expectation.
- Promote and build upon Scotland's international profile as a centre of excellence in stem cell research within a highly competitive global environment.
- Lobby within the national and international legislative and regulatory frameworks to establish Scotland as a competitive environment for stem cell development.

3.25 Subsequent chapters will assess the extent to which the SSCN has been able to achieve its objectives.

Summary and Conclusions

3.26 The stem cell sector and regenerative medicine is a priority sector in the UK and Scotland. It has attracted significant funding from the public and charitable sectors because of its potential to deliver new treatments for incurable illnesses, like chronic heart disease, diabetes and Parkinson's. At this stage, the stem cell sector is at an embryonic stage of development with its commercial and health opportunities yet to be exploited. Whilst there are powerful drivers encouraging the development of the stem cell sector, a range of technological, regulatory and strategic issues also need to be overcome before the economic and healthcare opportunities can be realised fully.

3.27 At this point in time, Scotland is regarded as one of the leading destinations in the world for stem cell research. Because of this and the investment made by the Scottish Government, Scotland has a competitive advantage that few other countries (yet) have within stem cell and regenerative medicine. As the following chapters will show, the activities of the SSCN have contributed to the development of the sector and Scotland's competitive advantage. Most notably, it has helped address information deficiencies and sectoral fragmentation – the market failures it was originally created to overcome. However, as explained more fully in subsequent chapters, this does not necessarily imply that there is no longer a need for a network.

3.28 The activities of the SSCN have aligned with, and supported, the priorities of Scotland's life science strategies. However, the economic and policy contexts have changed dramatically from when the SSCN was first established in 2003. New economic priorities have emerged and the SSCN has shifted the focus of its remit and activities in order to contribute to these. As shown in the following chapter, greater emphasis is now placed on the translation and commercialisation of research, as well as education and skills development. Both strands of work support and contribute to Scotland's economy and the long term development of the stem cell sector.

4 THE ACTIVITIES OF THE SSCN

4.1 The overarching aim of the SSCN is to support the development of Scotland's stem cell sector. This chapter presents an overview of the key activities undertaken by the Network to help achieve this ambition. These are structured against its core aims and objectives, although it is important to acknowledge that some activities address several objectives simultaneously. Before this, the Network's governance and management arrangements are outlined.

Governance and Management Arrangements

The Status of the SSCN

4.2 When the SSCN was first established in 2003, it was not a legal entity. All funding to support its activities was directed to the Marilyn Moore Partnership, a sole-trader entity set up by Marilyn Robertson (née Moore) and contracted by Scottish Enterprise via a service agreement to set up and run SSCN.²⁴ An evaluation of the SSCN in 2005²⁵ concluded that the Network had been successful and recommended that it should be incorporated as a legal entity separate from Scottish Enterprise for two reasons. Without a legal status, the SSCN was limited in the degree to which it could engage in public relations. A legal status would also enable the Network to be eligible to receive grants and other funding. In 2006, the SSCN became a company limited by guarantee that was a wholly owned subsidiary of Scottish Enterprise.

4.3 Funding from Scottish Enterprise is currently scheduled to come to an end in December 2012 (see chapter five for a more detailed overview of the way in which it is funded). Looking ahead, Scottish Enterprise will investigate other ownership models of the Network. There has already been some discussion about the Network's future ownership model, although no firm decision has yet been reached.²⁶

The Board of Directors

4.4 In line with corporate governance rules, when the SSCN became incorporated as a company limited by guarantee, a Board of Directors was appointed. As to be expected, its composition has changed over the years and it currently includes four members. The Board (as from Nov. 2011) is chaired by Prof. Marc Turner, (Professor of Cellular Therapy at the University of Edinburgh, Medical Director of the Scottish National Blood Transfusion Service (SNBTS)). The other three directors include representatives from Scottish Enterprise (one of whom is technically an Alternate Director) and the ESRC Innogen Centre. The Board sets the strategic direction of the SSCN and produces a strategy detailing key activities to be undertaken. It works with the Advisory Group (see below) and undertakes an annual review of the strategy and revises this as appropriate. Overall, the Board seeks to ensure that the Network's activities benefit the Scotland's stem cell community and Scotland as a whole.

The Executive Team

4.5 In 2003, SSCN activities were undertaken by a Network Director who was employed on a consultancy basis. As the Network's activities increased, in 2006 additional staff were employed (Network Director became Executive Director, a Finance Officer and a Marketing and Communications Assistant) and there is now an Executive Team in place that is responsible for carrying out the Board's decisions and implementing the Network's strategy. See the Figure 3.1 for a structure of the Executive Team.

²⁴ Scottish Enterprise Edinburgh and Lothian Biotechnology Team: Item No 10 (v) For Approval. December 2002.

²⁵ Scientific Generics Ltd. (February 2005) *Project Evaluation – Scottish Stem Cell Network. Report to Scottish Enterprise Edinburgh and Lothian.*

²⁶ Stage 5 Interim Review (September 2010) Scottish Stem Cell Network: KMIS Code: PZ0190.

4.6 A decision to appoint a Chief Executive Officer (CEO) was made in 2009. The Board of Directors considered such an appointment to be essential in order to help the SSCN become self-financing. The Board acknowledged that the appointment carried a financial risk as the additional salary commitment would place even more strain on the already stretched financial resources of the SSCN. Nonetheless, it was agreed that without the appointment, the SSCN would not be in a sufficient commercially oriented position to exist beyond the current phase of funding from Scottish Enterprise.²⁷ In line with his role, the CEO has been exploring various options to reduce the Network's dependence on public funding. These options (and their viability) are outlined in chapter eight. As a result of this recruitment and a subsequent restructure of SSCN, the role of Executive Director was made redundant and the post of Director of Operations created.

Figure 4.1:
SSCN's Organisational Structure



4.7 The current Executive Team comprises six members. The Director of Operations is responsible for the overall management of the Network's work, whilst other team members are responsible for specific activities. As illustrated, one member is responsible for marketing and co-ordinating events, whilst two others manage discrete areas of work that have emerged more recently. These are discussed in more detail below (see also case studies 1 and 2 in Appendix one), suffice to say, one team member is managing project REALISE, which is an initiative part funded by the Technology Strategy Board designed to support the translation of stem cell research into therapies for patients. The other team member has been recruited on a consultancy basis to manage the Network's growing portfolio of work around education and skills development as well as its more established strand of work centred on public engagement.

The Advisory Group

4.8 An Advisory Group was established to support the work of the Board of Directors and its key decisions. The Group meets on a quarterly basis and comprises individuals eminent in stem cell research as well as representatives from other sectoral interest groups including clinicians, regulators, patient groups, industry and the public sector. Until relatively recently, the Group was dominated by academic interests, although there is now much greater representation from business, which has increased its total membership to 15. As explored in chapter eight, there seems to be a misunderstanding between the role of the Advisory Group as intended/envisaged by the Board and that expected/desired by the Group itself.

Addressing Fragmentation

4.9 Over the last 15 to 20 years, stem cell research has attracted significant funding. In the early 2000s however, policy-makers became concerned that many such research projects and activities were being undertaken independently with little evidence of co-ordination

²⁷ Stage 5 Interim Review (September 2010) Scottish Stem Cell Network: KMIS Code: PZ0190.

between them or a sense in which a cohesive stem cell community was beginning to emerge. The SSCN has undertaken various activities to address this.

Events and Knowledge Exchange

4.10 One of the key ways in which the SSCN has sought to address sectoral fragmentation is by bringing together all groups that are active in the stem cell sector and/or those that have an interest in its development. Groups are brought together physically through a series of wide ranging events each year as well as virtually through the Newsletter and the SSCN website. The significance of these activities should not be under-estimated. The Newsletter, for example, has been nominated for several 'Communicators in Business' awards for professional magazines, achieving a good balance between news, research information, and its features on companies and key individuals. As these awards are not confined to life-science organisations, but encompass all industries, they help illustrate its success and external validation.

4.11 Similarly, there are various ways in which members benefit from events and the way in which they do so is detailed more fully in chapter six. Here, it is important to acknowledge that SSCN events have helped to facilitate relationships between members, which in turn, have sometimes led to different forms of collaboration and partnership working. It is also important to acknowledge that the events have facilitated collaboration between academic and industry, as well as between the different research institutes.

4.12 Initially, SSCN events mainly attracted academics and researchers. Over time, however, as their content evolved and as the potential for stem cell applications were more widely recognised, they began to attract a more diverse set of interests. Now, SSCN events bring together the full spectrum of those interested in the stem cell sector, not only the academics, researchers, but also clinicians, industry representatives, patient groups, charities, lawyers, ethicists, as well as members of the general public. This may, in part, be attributed to the success of the SSCN in responding directly to member need and demand with regards to the type of events to host.

4.13 SSCN events have evolved from primarily disseminating information about scientific research to events focused on the translation of research for therapies and route to market. The *Progress to Therapy* series is a key example of the latter and is detailed more fully later in the chapter. Box 4.1 sets out other examples of events hosted or organised by the SSCN focusing on commercialisation. On the whole, the interview findings suggest that, aside from a very small number of academics, most members are not only positive about the focus on applied research, but they view it as a natural progression of the role of the SSCN and necessary to help move the sector forward to the next stage.

Box 4.1: Examples of Commercialisation Events Organised / Hosted by SSCN

SSCN and DLA Piper 5th Annual Commercialisation Seminar – June 2011

Representatives from across regenerative medicine gathered at DLA Piper's Edinburgh office in June 2011 for presentations from a variety of speakers in the industry and a discussion on commercialisation in this sector.

The aim of the seminar was to learn from other industries and draw parallels with progress of different technologies to explore ways of transposing these into a successful model for the Regen Med industry in Scotland. It was a productive session which generated the key questions: what does success look like and what do we need to get there?

8th Annual BioProcessUK Conference – 30 November – 1 December 2011, Glasgow

Although a KTN organised event, SSCN was the host sponsor which meant that the event came to Glasgow and had a Stem Cell focus with dedicated workshops. The Annual bioProcessUK Conference has become the UK's leading technical networking meeting for professionals developing biological

Box 4.1: Examples of Commercialisation Events Organised / Hosted by SSCN

medicines. The programme was made up of keynote presentations, panel discussions and three themed master-classes. The key aspects were:

- How companies drive innovation to improve their global competitiveness
- Bioprocessing Research Industry Club (BRIC) as a driver for cutting edge academic research
- Focus session on the challenges of ATMP manufacture
- Case studies on strategic collaboration resulting in successful innovation
- The Peter Dunnill Award for outstanding contribution to UK bioprocessing.

4.14 The *Biology Forum* events, which explore the latest scientific discoveries, are the exception to the commercially-oriented events organised by the SSCN. Whilst one would expect these to be primarily of interest to academics, they also attract the attention of companies precisely because they highlight the latest developments within the stem cell sector.

4.15 It is important to acknowledge that many of the events organised or hosted by the SSCN attract international researchers and companies. This provides a key opportunity to build a strong relationship with them, which the Network does by working closely with Scottish Development International (SDI). Together, they promote Scottish capabilities and seek to secure for Scotland any activities or investment being considered by international companies or researchers. For example, over several years, the SSCN and SDI have developed a strong relationship with the American company ViaCyte. ViaCyte attended one of the first Progress to Therapy meetings (see below) and as a result of this and its knowledge of Scotland's capabilities (highlighted by the SSCN and SDI), it is currently considering the possibility of establishing an office and/or laboratory facilities in Scotland and undertaking a clinical trial. However, it is as important to note that such projects are often the result of many years' negotiation and relationship building. A more detailed discussion of joint working between SSCN and SDI is included below (see paragraphs 4.40–4.56).

4.16 The quality and relevance of SSCN events has been a key factor underpinning the growth of its membership. From 200 members in 2005/06, latest figures show this to have increased to 1200 (June 2011). Tables 4.1–4.3 provide a breakdown of SSCN's membership.

Scotland	799
Rest of UK	281
International	120
Total	1200

Academics	840
Companies ²⁸	84
Others	276
Total	1200

Scottish	33
Rest of UK	29
International ¹	15
Foreign owned ²	7
Total	84

¹ Foreign owned companies without a Scottish base.

² Foreign owned companies with a Scottish base.

²⁸ Note – SSCN estimates there are around 20% (some 240) of its members drawn from the commercial sector (a classification which includes charities). Hence, the number of business members may be more than 84 with additional large and small businesses included within the 'other category'.

Website and Social Media

4.17 Disseminating information to members and non-members is a key component of the SSCN's role and remit and the website is one of the primary mechanisms through which it achieves this. Table 4.4 lists the services available through the SSCN website. In general though, the website seeks to address the needs of various types of users. The events page is detailed, enabling professionals in the field to find out what conferences and workshops are coming up. The capability map, which is laid out geographically, outlines Scotland's strengths and helps those new to Scotland's regenerative medicine industry to get a feel for the breadth and depth of Scotland's offering. An external news feed supplies the site with around 3-4 news items a day and those of particular relevance are picked up by the SSCN team and promoted on the home page.

Table 4.4 List of services available through the SSCN website

- Information about the latest developments in stem cells and regenerative medicine research including regular 'expert opinion' pieces;
- Advice and information to patients regarding potential stem cell-based therapies;
- A secure password-protect area facilitating interactive networking, debating and messaging;
- Information on company sponsors;
- A national capability directory;
- Job vacancy alerts;
- Details of upcoming and past events;
- Educational resources;
- Contact, signposting and enquiry services; and
- Webinar capability.

4.18 In today's information age, however, it is no longer sufficient to create and update a user-friendly, informative website. Organisations of all types, but particularly those such as the SSCN whose remit centres on representation and engagement, must use social media to help achieve their aims. Accordingly, earlier this year (March 2011), alongside redesigning its website, the SSCN established three new social media accounts (Facebook, Twitter and LinkedIn).

4.19 The twitter account has built a rapidly growing following and has proven popular with other national networks, members of the public and those working in the sector of regenerative medicine. SSCN tweets are often re-tweeted, validating the importance and interest of its contents. The Californian Institute of Regenerative Medicine gave the Network a #FF, which is a stamp of approval for an account and a call to those who read the tweet to follow the SSCN. The success of SSCN's twitter account has been attributed to the way in which the team collects and processes news, events and opinion pieces from around the world. It seeks to provide a factual, non biased account of news, seeking to ensure that no misinformation is tweeted through the account.

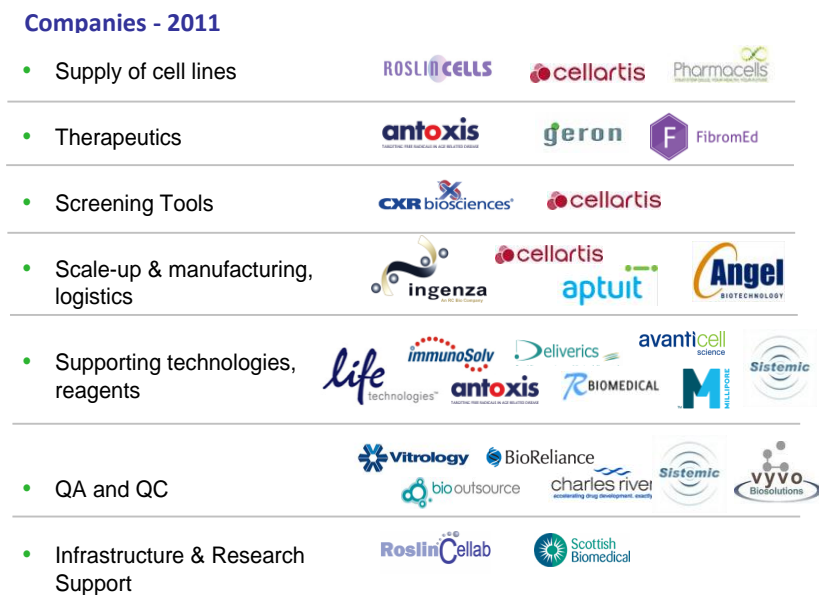
4.20 A knock on effect from the popularity of the twitter account has been an increase in visitor numbers to the SSCN website. In March 2011, the website reached 1500 hits, with 55% of these visitors having never viewed the site before.

Supporting the Development of a Nascent Industry

4.21 Despite significant activity taking place within the stem cell sector, much of it remains at the pre-commercialisation stage. Only two or three SMEs and start-ups exploiting the stem cell market existed in 2006/7 when SSCN identified a number of challenges to creating a stem cell industry:

- Poor communication between academia and industry. Industry is frequently unaware of scientific capabilities and technological opportunities, whilst academia often has a poor understanding of industry issues and needs.
- SMEs either lack the knowledge of how to access technologies from the research base or find it too costly to do so;
- Both the research base and industry are unclear about the route to market and clinic for stem cell products;
- Investors lack information about the use and benefits of technology, making it difficult for them to consider making an investment;
- Market research initially carried out by Roslin Cells indicates that the type of demand from SMEs may differ significantly from major industry or academic research contracts and as a consequence requires investment in the SSCN to provide additional resources to meet this demand. In essence, SMEs often require bespoke support that addresses their specific needs. This contrasts with major industry and academics who tend to have fixed and defined requirement (for example, information about skills and capabilities, links to collaborators and funders, etc.).

4.22 It should be noted however, that as of 2011, there are some 24 companies (either Scottish or with a base in Scotland) now active in the stem cells and regenerative medicine field as the following diagram illustrates:



4.23 The SSCN has been engaged in various activities and projects to help address these challenges as detailed below. To achieve this, the SSCN has leveraged its funding from Scottish Enterprise to increase its scope of activities and projects to support the growing stem cells industry. At a Strategic Review meeting of its advisors and members of the wider Network in December 2007, it was agreed to direct funds in 2008 to a consultation on developing a roadmap to clinical delivery in various disease areas. While this initially focused on navigating a path through the regulatory framework in the Europe and the UK, it recognised the need for more substantial funding than that allocated in the core Scottish Enterprise budget. Scottish Enterprise funds were therefore used to attract matched ERDF funding, successfully won in March 2009, which enabled a facilitated Road-mapping workshop, (run by New Game Plan Ltd) in May 2009. The outputs of this workshop became the core activity of the joint Scottish Enterprise/ERDF funded project, but also leveraged additional funds from Technology Strategy Board to develop a Therapy Pathway Realisation Tool, (Project REALISE) which was part of the workshop's draft Roadmap.

Scottish Enterprise/ERDF Project

4.24 This was applied for in 2008 for three years commencing April 2009. During that period Scottish Enterprise forecast funding was £651,000, which secured an additional £501,000 from ERDF for the same period. This enabled the delivery of a wider project designed to address the barriers to communication, identify routes to market and, ultimately, support the development of a sustainable industry. The project began in April 2009 and will end in October 2012. It comprises four elements:

- **Interdisciplinary workshops** focusing specifically on issues to support the development of a stem cell market. These have been designed to facilitate engagement between the science base and SMEs in order to develop new business models and commercialisation paradigms, thereby ensuring a pipeline of products and commercialisation opportunities in this emerging technology.
- **Internships and business mentoring:** SSCN has been organising placements in relevant businesses to increase the skills and knowledge of researchers/academics about starting and managing a business, raising awareness of IP issues, business planning and, overall, increasing their investment readiness.
- **Roadmap building:** The production of a series of routes to market and clinic "roadmaps" for stem cell products and services in order to support both the translation of basic research and the formation of new businesses.
- **Web 2 resources:** Provide information and interactive resources (such as guidelines for regulatory approval) specifically within a Web 2.0 environment to enable virtual conferencing, discussion forums

4.25 In essence, the project is seeking to develop Scotland's overall capacity to exploit new commercial opportunities in the sector and the emerging market.

Progress to Therapy Workshops

4.26 Progress to Therapy workshops are the core of the Scottish Enterprise/ERDF project bringing together scientists, clinicians, businesses and other key specialists such as regulators, patient advocates and health economists. They highlight the shift from using workshops to disseminate information (as an end itself) towards a greater commercial focus where the emphasis is placed on discussing ways in which to support the translation of research into actual therapies. The workshops are open to all those with an interest in the particular disease, including patient groups.

4.27 Each one-day workshop focuses on a specific disease area and the tools and technologies that are currently available. These are assessed rigorously against the roadmap

to identify the current position/status of available therapies and ways in which these can be progressed taking account of prevailing drivers and blockers for that disease/sector as a whole. Following the workshop discussion, the SSCN produces a report outlining the actions that need to be undertaken and by whom in order to produce a therapy for that disease area. The SSCN views this as a proactive tool to help strengthen Scottish capabilities in regenerative medicine. Over the long-term, it plans to use the Progress to Therapy series as a reference tool, with future workshops designed to track progress and highlight any new issues that need to be addressed. Box 4.2 presents an overview of the first workshop, which was held in May 2010. Since then, workshops have been held for other high level diseases in Scotland, including cardiovascular and neurodegenerative.

Box 4.2: Diabetes Progress to Therapy Workshop

In the first of a series of workshops examining progress to therapy in degenerative diseases, SSCN assembled a group of experts in diabetes, representing basic science, clinical delivery, patient interests and health economics.

The discussion was informed by the Network's Roadmap to Clinic, which identifies the key drivers, promoters, blockers. Presentations were given by representatives from:

- Juvenile Diabetes Research Foundation
- Scottish Diabetes Research Network
- Edinburgh Islet Transplantation unit;
- Viacyte Inc; and
- Grampian Health Board.

Key points emerging from the workshop discussion were:

- The need for a planned communications strategy to patients and the general public;
- Replacement treatments, in particular cell therapies or drugs to stimulate beta cell regeneration;
- Clarification on clinical endpoints for trials need - insulin dependence may not be required;
- Patient databases, such as those already in use in Scotland, will be of key importance in assessing the impact of future therapies;
- The need to confirm composition of the final product: ViaCyte's studies using encapsulated islet precursor cells, derived from clinical grade ES cell, present a clear option;
- How cost effectiveness of future treatments will be assessed affecting the route to uptake by the NHS.

4.28 Following on from the workshops, the SSCN is planning to host a three-day Progress to Therapy Conference in March 2012. It will bring together international experts to follow-up on the key questions raised during the workshops, namely, "*What are the challenges and opportunities facing progress to regenerative medicine therapies?*" During the conference, there will be plenary sessions in which keynote speakers will present their experience of taking a range of regenerative medicine products into market. These will be complimented by interactive workshops examining some common challenges in manufacturing, imaging, regulation, business modelling and data handling. In line with our Progress to Therapy workshops, this event has been planned as departure from "information download" and progression to "interactive action setting".

Project REALISE

4.29 A key element of the initial Roadmap to Clinic, produced by the May 2009 workshop, was the Therapy Pathway Realisation Tool. Building on this work, and making best use of the emerging analysis, the SSCN formed a consortium and explored ways in which resources could be developed to help translate scientific discoveries into useable technologies and therapies. The consortium, comprising Roslin Cells, Innogen (the University of Edinburgh) and KLCE consulting, developed the idea for project REALISE. The overarching objective of

the project was to develop an interactive tool that would guide industry from discovery through to the delivery of therapies.

4.30 Funding for project REALISE was secured from three sources, including that from one of the prestigious, highly competitive call for bids made by the Technology Strategy Board. In so doing, the project exemplifies a key strength of the SSCN, which is around identifying overlapping areas of work between organisations with different remits and then facilitating their collaboration. In the current climate, this is essential to secure funding from bodies such as the Technology Strategy Board where demonstration of cross-sectoral collaboration is often a precursor or criterion underpinning an award. The Scottish Government and the Economic and Social Research Council also made a financial contribution to the project.

4.31 Appendix one (case study one) includes a more detailed overview of project REALISE. Here it is useful to highlight that its key objective is to identify and address the barriers to commercialisation enabling companies using the software tool to plan and model a route to market for their particular product. In so doing, the project seeks to address the following aims:

- Improving the awareness of the processes involved from early stage research to market authorisation;
- Increasing the potential for commercial success of new discoveries;
- Enhancing and accelerating the development of new therapies at an early stage in the development process;
- Improving business and financial planning to realise the commercial potential of new discoveries.

4.32 Interview respondents identified project REALISE to be one of the most significant achievements of the SSCN. The project will be launched at the Progress to Therapy Conference in March 2012.

Market Making

4.33 The Progress to Therapy workshops along with project REALISE focus on finding and supporting routes to market. This pre-supposes that there are already pre-existing markets. However, given the embryonic stage of the stem cell sector, market-making is a key function of the SSCN. In conjunction with the SDI, it regularly visits companies both within the sector and related areas to alert them to the latest research developments specifically to stimulate thinking as to how the research can be applied clinically. SSCN and SDI also visit the large pharmaceutical companies to keep them abreast of both research and commercial activities taking place in the stem cell sector across Scotland. Such meetings have a range of intangible benefits. They are important for networking, relationship-building, and reminding small and large companies of the capabilities present within Scotland. They also potentially benefit the Network's membership, providing them with valuable market intelligence they may not otherwise come by and potentially facilitating introductions.

4.34 Access to finance is an issue that faces companies across all sectors, but perhaps particularly the newly emerging, high-tech ones such as stem cells. Banks and venture capitalists can be reluctant to invest in areas where there is no proven record of commercial return and/or when they have little understanding of the sector and the advances being made. Against this context and as part of its market-making function, the SSCN (in partnership with Scottish Enterprise) has approached established venture capital firms to find out the reasons as to why investors are reluctant to finance companies operating in the sector and the ways in which the Network could support them to do so. For example, SSCN and Scottish Enterprise gave a formal presentation to Walter Scott – a company specialising in equity investments

and portfolio management – followed by a discussion with their Board. No formal outputs have been recorded.

Knowledge Transfer Awards

4.35 As part of its shift towards focusing on the translational aspects of stem cell research and regenerative medicine, the SSCN rebranded its Travel Awards as Knowledge Transfer Awards in March 2010. The Travel Awards were geared towards young researchers, enabling them to attend overseas conferences they would otherwise have found difficult to fund.

4.36 The Knowledge Transfer Awards are specially aimed at helping small companies' to access new research and to develop new markets, as well as allowing academics to reach commercial outlets with the ideas. Together, SDI and SSCN select a number of conferences each year that represent good opportunities for the academic and commercial sectors to mix and exchange information (for more detail see section below: *Promoting Scotland's International Profile*). Applications are then invited for awards. To qualify, applicants must demonstrate clear knowledge exchange between academia and industry. For example, individuals from companies may attend technical or research conferences to identify commercial opportunities, or academics may attend clinical or translational research conferences to identify where their research may have commercial applications. Alongside the conferences identified by SSCN, members are welcome to apply for ad hoc conferences, providing they fit with the eligibility criteria.

Technology Development Grant

4.37 As detailed above, 'Internships and business mentoring' comprised one of the four activities of the multi-stranded project part funded by ERDF and part funded by Scottish Enterprise. The internships could comprise students/graduates interns working within Scottish stem cell companies or young professionals in industry taking a placement at a research institute. The overarching aim of the internships was to transfer knowledge and experience between academia and industry. However, the take-up from companies was low; either they could not afford a member of staff to be released to undertake a placement, or they could not afford the costs associated with hosting an intern. As a result, towards the end of 2010, ERDF funding had still not been defrayed. In response, the SSCN consulted its members as to how the funding could be re-allocated on activities they would find most valuable. It also negotiated with the ERDF Secretariat to change the use of the original funding.

4.38 On the basis of the results of the consultation exercise, it was decided that companies could submit Expressions of Interest for grants of up to £5,000 to fund projects demonstrating knowledge transfer and with clear economic outputs. Companies are expected to make a contribution to their project, either financial or in-kind.

4.39 To date, five grants have been awarded, together equating to £24,000. One of the projects will help Generation Scotland²⁹ retrieve patient data from its database easier and faster. The SSCN is responsible for monitoring the progress of each project. It expects to award £10,000 across two more projects over coming months.

²⁹ Generation Scotland is a multi-institution, cross-disciplinary collaboration which is seeking to create a series of biomedical resources for the study of common complex disease. The Generation Scotland concept has been evolving for several years and now involves three complementary projects, the Scottish Family Health Study (GS:SFHS), Genetic Health in the 21st Century (GS:21CGH) and the Donor DNA Databank (GS:3D). Generation Scotland has three extensive collections of DNA, other biological samples and data. For more details see: <http://www.generationscotland.org>.

Promoting Scotland's International Profile

4.40 There are two, inter-related dimensions to SSCN's international work. It seeks to promote Scotland as a primary destination for stem cell research and commercial activities. It also seeks to develop links with other international stem cell networks, research institutes and companies. To achieve these aims, the SSCN works in partnership with SDI. A close working relationship has developed between the two where all international related activities are planned jointly. For instance, they decide together which stem cell/life science events and conferences should be attended and by whom, that is, whether there is a need for a joint presence or whether it is sufficient for one of them to attend and if so, who is best placed to do so.

4.41 Similarly, they work closely together to host visits from international companies and researchers. Indeed, they recently found themselves in the rare situation of hosting potentially two very valuable visits on the same day. One was a delegation from Korea and the other from an American company considering Scotland as the destination to undertake a clinical trial for Type I diabetes. Together they planned what would be the best division of labour to secure maximum advantage for Scotland. SDI acted as hosts for the Korean delegation, with support from SSCN, facilitating meetings between the Korean companies and the most appropriate Scottish companies and research institutes. By way of contrast, SSCN was host to the American company organising its visit, with support from SDI. This example illustrates the high level of co-operation that exists between the SSCN and SDI.

4.42 Overall, both organisations share the same overriding objectives: to avoid duplication; to add value to each other's role and area of expertise; and ultimately work together for the benefit of Scotland.

Participation at International Events

4.43 Each year the SSCN and SDI jointly attend two of the stem cell sector's biggest and most high-profile events, which are the World Stem Cell Summit, and the annual conference of the International Society for Stem Cell Research (ISSCR) – see Box 4.3 for details. Both attract leading scientists and companies from around the world. The overarching aim of attending these (inward investment) events is to attract SMEs, from around the world, to Scotland by promoting Scotland's academic capabilities and its cutting-edge infrastructure (such as the BioQuarter and the Scottish Centre for Regenerative Medicine). Through networking, giving presentations and distributing promotional material, together the SSCN and the SDI seek to present a single, consistent message: Scotland is the place to research, develop and commercialise stem cell related products. It has the necessary infrastructure, business support and a base of companies already established and operational and is therefore an ideal base for European markets or as a base to conduct clinical trials.

4.44 Attending two international events may not appear onerous, yet they require a lot of time and effort to organise. Indeed, one of the key ways in which the SSCN adds value to the work of SDI is by taking responsibility for designing, updating and producing brochures and other material about the Scottish stem cell sector with input from the Scottish Enterprises' Life Sciences team. One respondent noted, without such high quality brochures "*...our message about Scotland's capabilities would have had less impact*" (Economic Development).

4.45 SSCN and SDI also spend time following-up on leads generated at international events. For example, after the 2010 ISSCR Conference in San Francisco, and the 2011 ISSCR Conference in Toronto, SDI and SSCN made further contact with several companies, including: ACT, iPerian, and ViaCyte. In building these relationships, new business was secured for two Scottish companies: Angel and Sismic.

Box 4.3: SSCN and SDI Promoting Scottish Stem Cell Sector

ISSCR Conference , 2011,

SSCN and SDI exhibited at the 9th Annual Meeting of the ISSCR which was held in Toronto, Canada, June 2011. The conference was attended by over 3,700 regenerative medicine professionals and around 130 exhibitors. Alongside the SSCN and SDI, Scotland's presence was represented by Angel Biotechnology, Sitemic, Cellartis, FibromEd, the University of Glasgow and the Scottish Centre for Regenerative Medicine (SCRM).

As part of this event, SDI hosted a high profile networking event in Toronto made possible through the GlobalScot network. This event brought SDI and Scottish companies together with the local GlobalScot community, a number of target companies and Professor Sir Ian Wilmut representing the SCRM.

The SSCN/SDI stand attracted a large number of major companies. SDI also hosted a highly successful whisky tasting event. On Thursday 16th June, organised by SDI, SSCN chaired an Innovation Showcase; "*Innovation in Scotland: Novel Stem Cell Tools and Technologies*". Over 70 delegates attended with presentations by Sitemic, the University of Glasgow and FibromEd. This represented a major opportunity for Scotland to showcase its strengths in the stem cell field and maximise awareness of its scientific excellence.

Hosting International Conferences

4.46 Partly because of its success in promoting Scotland's stem cell credentials and partly because of the long-standing relationship developed with the ISSCR, the SSCN was invited to submit a proposal to host the 2015 ISSCR conference in Scotland.³⁰ Arguably, this is the sector's most important event of the year, bringing together the world's leading academics, researchers and scientists. The SSCN took the lead in writing the bid and coordinating the input from its members, Scottish Enterprise and Glasgow City Council, with Glasgow the proposed destination to host the conference. In putting together the bid, the SSCN raised £400,000 in sponsorship from a number of sources (including, Glasgow Marketing Bureau, Glasgow City Council, Visit Scotland, the universities of Edinburgh, Aberdeen, Glasgow, Newcastle and the Scottish Funding Council (SFC)). An Invitation to tender to host the event is considered a mark of success in its own right and not only reflects well on SSCN, but also recognises the sectoral capabilities of Scotland. There is a consensus amongst interview respondents that without the SSCN, Scotland would not have been invited to bid.

4.47 The SSCN was also invited to submit a proposal to host the 2014 World Stem Cell Summit. Much smaller than the ISSCR, its target audience is also different. Principally, it attracts translational companies and focuses on the ethical, regulatory and legal issues associated with stem cell research and regenerative medicine. Again, the SSCN took the lead in writing the bid and coordinating the contribution of others. If successful, the Summit will be held in Glasgow's Commonwealth Games Arena.

Supporting Inward Investment Missions

4.48 The SSCN also supports SDI with international trade missions focused on the life-sciences/ stem cell sectors. Scottish companies also take part in these exhibitions and it is an effective way for them to network, to market their products, test markets, attract customers, and/or appoint agents or distributors. Conversely, the international trade missions provide another opportunity to promote Scotland's capabilities, and are a mechanism for attracting inward investment. See Box 4.4 for an overview of the Bio Trade Mission attended by SSCN and SDI in June 2010.

³⁰ On 2 December 2011, ISSCR announced that its meeting in 2015 would be held in Stockholm, Sweden, thereby rendering the Glasgow bid as unsuccessful.

Box 4.4. SSCN and SDI Promoting Scottish Stem Cell Sector at International Trade Missions

2010: Bio Conference, Chicago

In May 2010, the three-day annual BIO Conference in Chicago attracted 20,000 visitors. SSCN took part in the SDI mission to BIO, which was exhibiting at the Scottish Pavilion, part of the UK stand. Over the course of the event, the stand attracted a high number of visitors, reinforcing the level of interest internationally in stem cells and regenerative medicine. SSCN was not alone in showcasing the work going on in the sector, with many companies and other countries also promoting their positions in this field.

The 2010 event had an extensive partnering section, where over 17,000 meetings were held over the course of the show. This was in addition to the scientific sessions that ran in multiple streams during the day. The highlight of the event was a lunchtime seminar with Bill Clinton, George Bush and Al Gore.

Outside the exhibition, SDI held its traditional Scottish evening at the top of an 80 stories high Tower. A meeting was also held with GlobalScot, an organisation that has formed a network of influential ex-pat Scots across the world with the aim of helping to promote and develop the commercialisation of Scottish businesses. Representatives from the GlobalScot network provided some useful insights and suggestions to the overall Life Science strategy for Scotland.

4.49 As with attending conferences, both SSCN and SDI follow up on leads generated at trade missions. For example, after a trade mission to Japan, the two organisations entered discussions with a number of companies, including Reprcell and iCEMS and a collaboration has been signed with the latter.

4.50 Overall, there is extensive collaboration between the SSCN and SDI with both adding value to the activities of the other.

Developing Links with International Stem Cell Networks

4.51 The SSCN is a founder member of the International Consortium of Stem Cell Networks (ICSCN), which was established in June 2005. The Consortium is committed to fostering international collaboration between national stem cell networks. Since its creation, the ICSCN has been:

- providing a forum for exchange of best practice and the development of international equivalents of successful national initiatives;
- encouraging and facilitating the exchange of researchers and trainees between network members; organising and promoting international workshops, especially on topics where the expertise within any one jurisdiction may be limited;
- facilitating communications to help in the coordination of research and translation between different countries.

4.52 Alongside the international events it attends, the ICSCN is a key mechanism through which the SSCN develops links with other international stem cell networks, and in turn, the research institutes and companies of that country. For example, the SSCN has developed strong links with the Florida based Genetics Policy Institute (GPI) and the California Institute of Regenerative Medicine (CIRM). The GPI is a charitable organisation promoting stem cell research and regenerative medicine. SSCN is one the GPI's key partners and has participated in events organised or hosted by the Institute, including the annual World Stem Cell Summit. Indeed, SSCN submitted the bid to host the 2014 World Stem Summit in Glasgow after encouragement from GPI (the founder organisation of this series).

4.53 SSCN also works very closely with the CIRM; a relationship which began in 2007 and was developed through membership of the ICSCN. The SSCN brokered meetings between the CIRM Executive and Scottish Enterprise which has led to a Memorandum of Understanding between the two groups.

4.54 SSCN has worked directly with SDI in California to identify how Scottish groups can work with CIRM funded companies and researchers. An example of this was the visit to the University of California Tech Transfer meeting in April 2009 by an 8-strong group of Scottish investigators. The meeting was co-hosted by the Canadian Government and CIRM. This group subsequently met with various companies and academic groups within the CIRM consortium, which has led to visits by some of them to Scotland (e.g Kevin D'Amour, Viacyte Inc) and an informal agreement with the San Diego consortium to collaborate once the MOU between Scotland and CIRM was in place.

4.55 SSCN's links with international stem cell networks, and in turn, the research institutes and companies of that country has proven beneficial to members who have been able to draw on these contacts as and when necessary, saving them time and effort (see chapter six for more detail).

4.56 Links with international networks have also supported SSCN with some of its projects, most notably for *Talking Stem Cells*. This project is being delivered to secondary school pupils across Scotland and is designed to encourage them to choose to study subjects relevant to regenerative medicine. As *Talking Stem Cells* is much larger in scale than the pilot project that was undertaken, additional materials were required. Aware that similar projects had been undertaken in Canada and Australia, the SSCN contacted the two Networks and both of them made available the resources they had used. These were adapted to the Scottish context and, in the process, saved the SSCN and its members considerable time and effort.

Public Engagement

4.57 One of the key aims of the SSCN is to engage with the public in order to increase their understanding of stem cell technology and its potential health benefits. Since its formation it has undertaken a series of public outreach and educational activities. These include annual presentations at the Edinburgh International Science Festival (except 2010), as well as organising public debates linked to the Network's scientific workshops in Aberdeen, Glasgow, Dundee and St. Andrews.

4.58 Public engagement has been prioritised because of the moral and ethical issues relating to stem cell research, as well as the high level of publicity surrounding its potential contribution to treatments and therapies for some of the most debilitating illnesses. In this context, there is a high risk of misinformation and the SSCN views its role as providing impartial, factual and realistic information about the possibilities and limitations of stem cell research and products. This includes providing clear facts to inform ethical debate about the use of embryonic stem cells, as well communicating information about the efficacy and risks associated with purchasing (unregulated) stem-cell related therapies over the internet. If the stem cell sector is to remain as one of Scotland's priority sectors, the importance of such a role should not be underestimated.

4.59 Details of a recent public outreach project are given below to illustrate both the role of the SSCN and the wider impact of the project. The project, although initiated by the SSCN, was delivered by the Glasgow and Dundee Science Centres and has reached thousands of people. Both of them firmly acknowledge that without the SSCN, the project would not have occurred at all.

Stem Cells & Regenerative Medicine: Stemming Expectations with Knowledge

4.60 As a result of undertaking various public outreach events and through questions posted on the Network's website, the SSCN became aware of three reoccurring questions at the forefront of the public's interest in stem cells:

- What treatments are available for conditions such as multiple sclerosis, arthritis, diabetes and stroke?
- Why are some ‘treatments’ being offered at high cost in overseas clinics?
- Why have more clinical trials not started in the UK?

4.61 In light of this, the SSCN sought funding from the Science Engagement Grant (SEG) programme to develop a series of resources, which would give people the up-to-date knowledge to address these questions and equip them to differentiate between treatments offering real hope for cures and those making false claims. In this way, the project has sought to contribute directly to *Science for All Agenda* introduced by the UK Government and the *Smarter Scotland* objectives of the Scottish Government.³¹

4.62 Securing funding of £40,000, the project sought to achieve two further objectives:

- To develop a partnership with Scotland’s science centres and other public information spaces such as libraries and galleries. These attract significant visitor numbers but find it difficult to access accurate, engaging content for their exhibition infrastructure. The project worked with the Dundee and Glasgow Science Centres to develop interesting, informative and interactive material about stem cells, enriching the visitor experience and also helping them to make informed decisions about their health.
- To build capacity in Scotland’s science community. Academic members of the SSCN are required to communicate their research in the public arena, yet often lack the resources to do so. The project provides them with this.

4.63 The project facilitated the production of three types of resources:

- Factual material describing the science and medical implications of stem cell research.
- Interactive quizzes and challenges, examining the moral and ethical issues underpinning the science;
- Decision making activities, allowing the public to consider the complex issues arising from the new regenerative medicine technologies.

4.64 The SSCN marshalled the knowledge and skills of its members to develop the public outreach material, which was undertaken in partnership with the Glasgow and Dundee Science Centres. Whilst the scientists focused on the content, the Science Centres drew on their expertise as how this should be presented.

4.65 The project was launched at the Edinburgh International Science Festival in March 2011. Shortly thereafter, the portfolio of resources was displayed at exhibitions at the Dundee Science Centre and Glasgow Science Centre. The resources are available in the form of exhibition infrastructure, which can be used as stand-alone information events or wider installations. They can also be downloaded from the Network’s website for science discussion groups.

Education and Skills Development

4.66 There are major skills challenges facing all sectors within Life-Sciences, including the stem cell sector. The most common are:

³¹ Application for Science Engagement Grants 2010–2011.

- ensuring the continuing supply of appropriately qualified staff at all levels from technician to CEO level;
- attracting, retaining and developing Board level and senior managers with relevant international commercial experience in life-sciences to grow spin-out firms and help develop a critical mass within the industry;
- ensuring Scottish graduates, with commercial aspirations, and junior managers stay in Scotland to pursue their careers.

4.67 The SSCN is helping address some of the skills challenges through its public outreach projects with schools, several of which have been funded by additional Science Engagement Grants: *Lets Talk Stem Cells* (£17,000 in 2009) and *Talking Stem Cells* (£25,000 in 2011). The Network has also been successful in securing funding from the ESF to develop a MSc for Regenerative Medicine for the Pharmaceutical Industry. The MSc is being put together by the University of Edinburgh and will be available in October 2012. Case Study 2 in Appendix one provides a detailed overview of SSCN's education related activities.

4.68 At this stage, it is difficult to assess the impact and value of SSCN's work in education and skills development since potential benefits will occur in later years. Nonetheless, given the links between high-level skills and economic growth, it is reasonable to assume that these activities are supporting the long term development of the stem cell sector and the wider Scottish economy. Conversely, without raising awareness of the opportunities available within the sector to the future workforce, there is a risk of undermining the competitive advantage that Scotland has developed over the previous decade and being overtaken by global competitors.

4.69 SSCN's work in education also has the potential to secure regeneration benefits. One of its projects is based in Midlothian, a former coal mining area. The local council expects that SSCN's project will encourage and make it easier for 'non traditional participants' to access occupations in science and technology sectors, and help it improve outcomes for school leavers.

4.70 The Network's portfolio of work around education and skills has emerged over the last couple of years and complement its greater focus on the translation of research for therapies and the commercialisation process. The underlying objective of both streams of work is to support the long-term development of the Scottish economy and, in the short term, its recovery from the current recession.

SSCN and Charities

4.71 The SSCN has links with several charities: the MS Society, Diabetes UK, the British Heart Foundation, and the UK Stem Cell Foundation. To date, the SSCN has developed the strongest relationship with the MS Society. The Chief Executive of the Society is a member of the Network's Advisory Board. Representatives from the Society often give presentations at key SSCN events about the patient perspective. In essence, though, SSCN's links with charities are not as strong as those with researchers and companies, which is not surprising. This could be an area the Network may wish to explore in future.

The British Heart Foundation

4.72 The British Heart Foundation (BHF) is an established, large charity whose mission is to play a leading role in the fight against disease of the heart and circulation, so that it is no longer a major cause of disability and premature death.³² It is the biggest non-commercial funder of cardiovascular research in the UK, investing around £200 million over the past three

³²³² <http://www.bhf.org.uk/about-us/what-we-do.aspx>

years.³³ A significant proportion of the BHF's research budget is directed at research that uses stem cells from human or animal embryos, as well as adult tissues. In addition, the BHF has a long standing commitment to reduce heart failure in Scotland. As well as funding the largest, independent programme of Heart Health research in Scotland, investing £38 million to date,³⁴ it has also been a key funder of several stem cell translation projects:

- The BHF's *Mending Broken Hearts Appeal* kicked-off in Scotland when the charity donated £1 million to the Scottish Centre for Regenerative Medicine. Its £1 million grant is providing dedicated laboratory space for 25 researchers working across the cardiovascular research spectrum.
- In September 2011, the BHF conferred the University of Glasgow's Professor Andrew Baker as a BHF Professor of Translational Cardiovascular Sciences. This award includes £1.1 million of research funding to support Prof Baker and his team to work on several cutting-edge research programmes that are aiming to develop new treatments for heart patients. This includes therapies that use stem cells to re-grow lost or damaged blood vessels. The funding is also contributing towards new experiments and essential laboratory equipment at the University of Glasgow.³⁵

4.73 In relation to the SSCN, as a charity, the BHF is unable to provide endorsement for SSCN's activities. However it indirectly supports the work of SSCN by attending networking events and inward investment meetings. The BHF values SSCN's role in raising public awareness of stem cell research, managing public expectations and reducing misinformation. The BHF recently established a £50 million fund for stem cell research and developmental biology, which is available across the UK. The SSCN has been raising awareness of the Fund amongst its members and providing them with support to access funding for research projects.

UK Stem Cell Foundation

4.74 The medical charity, the UK Stem Cell Foundation (UKSCF) was set up in 2005 to speed up the progress of translating stem cell research and technology into treatments and therapies for patients. In particular, it seeks to address the funding gap that prevents early stage research reaching clinical trials. Primarily, it does this by working in collaboration with others to co-fund stem cell research projects. These include private donors, charitable trusts and foundations as well as public sector funders, including Scottish Enterprise.

4.75 Scottish Enterprise has made available funding for two research funds administered by the UKSCF. In 2005, Scottish Enterprise established the £5 million Stem Cell Translational Fund, which was designed to further the clinical development of regenerative therapies utilising stem cell research across Scotland. The Translational Fund was closed in 2011, although Scottish Enterprise has made available £300,000 over 3 years to facilitate a new research fund, which was launched by the Foundation in September 2011. The Foundation is seeking to raise £5 million over the next three years to underpin Scottish research to combat illnesses such as diabetes, MS, strokes and Alzheimer's. In addition to these, the UKSCF has supported several other stem cell research projects in Scotland in collaboration with Scottish Enterprise. These have focused on treatments for liver disease, corneal blindness and bone and cartilage repair.

4.76 There is limited engagement between the UKSCF and the SSCN and, therefore, a clear opportunity to work closely together on identifying and progressing translational research projects in Scotland.

³³ <http://www.bhf.org.uk/about-us/our-policies/research-policies.aspx>

³⁴ <http://www.bhf.org.uk/get-involved/in-your-area/scotland.aspx>

³⁵ http://www.gla.ac.uk/news/headline_211058_en.html

Summary and Conclusions

4.77 The role and activities of the SSCN have evolved and are focused on four key areas: providing networking opportunities, supporting the translation and commercialisation of stem cell research, promoting Scotland's capabilities internationally, and education and skills development. Although a small team, the SSCN undertakes an extensive number of activities within each of these areas, all of which contribute to the long term development of the sector. It is able to undertake these effectively and efficiently, partly because it has an unparalleled overview of the stem cell sector in Scotland. In turn, this overview can be attributed to SSCN being extremely well networked, having links and relationships with not only Scottish companies and research institutes, but international networks, companies and researchers.

4.78 The SSCN is able to undertake an extensive variety of activities because of its skills in brokerage and partnership working. Many of its projects are not delivered directly; instead the SSCN draws on the expertise of its members, coordinating their inputs, and assuming a leadership role by taking responsibility for implementation. At this point, it is difficult to identify another organisation that would perform such a function. Whilst individual members are happy to make a contribution, lack of time deters them from taking the lead responsibility for any given project or activity.

5 FUNDING AND PERFORMANCE

5.1 This chapter is divided into two main sections. The first presents a funding profile of the SSCN, identifying its main funders and the level of funding secured by discrete projects. The second section assesses its contractual performance covering the period January 2006 to March 2011.

An Overview of SSCN Funding

5.2 Scottish Enterprise is one of SSCN's primary funders. Between 2006 and 2015, the Network was profiled to receive circa £1.75m from Scottish Enterprise. This amount was intended to represent half of the SSCN's total operating costs over a ten year period, with the remaining funding to be raised from external organisations.

Funding from Scottish Enterprise

5.3 Table 5.1 presents an overview of the total amount of funding allocated to the SSCN by Scottish Enterprise up to the end of the 2010/11 period.

Table 5.1: Scottish Enterprise Funding (Profiled and Actual)							
	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	Total
Profiled	£350,000	£348,000	£338,000	£301,000	£224,000	£126,000	£1,687,000
Actual	£266,000	£352,800	£334,000	£177,000	£285,000	£185,000*	£1,599,800
Variance	-£84,000	£4,800	-£4,000	-£124,000	£61,000	--£59,000	-£87,200
Source: Scottish Enterprise, SSCN							
* Actual to November 2011							

5.4 The majority of funding from Scottish Enterprise has been frontloaded with 65% defrayed in the first four years, largely to cover the Network's operating costs during its early years of development. It should be noted that the original profiles (taken from the 2005 Scottish Enterprise approval paper) were latterly adjusted to enable match funding for the ERDF award from 2009-2012 (see paragraph 5.12).

5.5 By the end of November 2011, the Network had received £1.6m from Scottish Enterprise, and it is expected that it will receive a further £150,000 up to 2013. SSCN also received £348,500 from Scottish Enterprise between 2003 and 2005. In total then, it has received £1.95m from Scottish Enterprise to date.

External Funding Sources

5.6 In keeping with its objective to become self supporting, SSCN has successfully accessed external funding amounting to circa £850,000 from additional sources – see Table 5.2.

Table 5.2: Non Scottish Enterprise Income (2006/07 - 2010/11)		
Funding Source	Value	Dates
ERDF Grant*	£501,498	2009/10-2011/12
TSB Grant*	£160,210	2010/11-2011/12
Science Engagement Grants*	£90,573 ³⁶	2009/10-2011/12
Sponsorship Income	£49,847	2008/09-2010/11

³⁶ includes £8,500 from Agilent Technologies

Table 5.2: Non Scottish Enterprise Income (2006/07 - 2010/11)		
Funding Source	Value	Dates
Exhibit Sponsors	£16,291	2006/07-2009/10
New Business	£13,173	2010/11
Income from SSCN Activities (e.g. workshops)	£19,875	2008/09-2010/11
Total	£851,467	
Source: SSCN		
*These amounts represent total approved funding. Not all monies have yet been drawn down by SSCN.		

5.7 The SSCN has also explored other options for raising revenue, which are outlined in chapter eight.

Income and Expenditure Analysis

5.8 SSCN has been able to generate income from external sources (as shown in Table 5.2). There has been a notable increase (of 1138%) in SSCN's income generation over the last three years allowing SSCN to increase its activities and impact accordingly. Table 5.3 presents an analysis of SSCN's income and expenditure between 2008/09 and 2010/11.

Table 5.3: Analysis of SSCN's Income and Expenditure				
	2008/09	2009/10	2010/11	Total
Income				
SE Income	£334,000	£177,000	£285,000	£796,000
Non SE Income	£27,034	£138,207	£334,713	£499,955
Total Income	£361,034	£315,207	£619,713	£1,295,955
Expenditure				
Activity Costs	£245,678	£157,900	£206,775	£610,353
Operating Expenses	£163,942	£154,061	£339,071	£657,074
Total Expenditure	£409,620	£311,961	£545,846	£1,267,427
Source: SSCN				

5.9 The five primary areas of expenditure (combined accounting for 53% of total expenditure for the period) were as follows:

- Wages (£423,000);
- Workshops (£71,000);
- Public outreach activities (£66,000);
- International conferences (£62,000); and
- Marketing (£53,000).

5.10 The top four sources of non-Scottish Enterprise income over the same period were European Regional Development Fund (ERDF) (£240,000); Technology Strategy Board (TSB) (£104,000); Science Engagement Grants (£64,000); and sponsorship income (£50,000). The following paragraphs provide brief overviews of these external funding sources.

ERDF Grant

5.11 Over half (58%) of SSCN's external income has been obtained from the ERDF, match funded by Scottish Enterprise. In 2009, the Network obtained approval for ERDF

funding totalling £501,498 over three years – see Table 5.4. At the end of year two, SSCN had drawn down £239,719, which is slightly under half (48%) of the total ERDF grant amount.

Table 5.4: ERDF Profiled Spend			
2009/10	2010/11	2011/12	Total
£167,166	£167,166	£167,166	£501,498
Source: SSCN			

5.12 As the result of a projected underspend relating to the ERDF project, approval has been obtained for an extension of the ERDF grant period to September 2012, giving the Network an additional six months to draw down the full grant amount. The extension will enable the Network to deliver additional knowledge exchange workshops, which will support SMEs to develop technologies and skills in the regenerative medicine sector.

Technology Strategy Board (Project REALISE)

5.13 In April 2010, SSCN and three consortium partners obtained £449,265 from the Technology Strategy Board to contribute towards the costs of project REALISE (see chapter four for an overview of project REALISE). The TSB grant represented 72% of the total project costs (£627,383). Table 5.5 shows the funding profile for each partner, including the actual amount spent to date.

Table 5.5: Project REALISE Funding Profile			
Partner	Profiled Funding	Actual to November 2011	% of Grant
SSCN	£160,210	£125,124	78.1%
Roslin Cells	£109,000	£97,882	89.8%
KLCE Consulting	£26,000	£26,000	100.0%
University of Edinburgh (Innogen)	£154,055	£140,960	91.5%
Total	£449,265	£389,966	86.8%
Source: SSCN			

5.14 By the end of November 2011, project partners had spent the majority of the TSB grant, with just under £60,000 remaining. In April 2011, ESF funding of £147,000 was obtained to deliver the ‘*Capability Building for the Regenerative Medicine Industry*’ project which builds on project REALISE.

Science Engagement Grants

5.15 SSCN has received three education grants (through the Scottish Government’s Science Engagement Grants programme), which has supported the delivery of its public outreach and educational activities. These grants covered three projects: the Stem Cell Road-show; Stemming Expectations with Knowledge; and Talking Stem Cells. The two latter projects are on-going. Table 5.6 shows the value of the education grants.

5.16 In 2009, the Network also received around £8,500 from the Agilent Foundation to develop teaching resources for the Stem Cell Road-show project.

Table 5.6: Science Engagement Grants	
Project	Value of Grant
Stem Cell Road-show	£17,000
Stemming Expectations with Knowledge	£40,000
Talking Stem Cells	£25,000
Total Value	£82,000
Source: SSCN	

Performance against Indicators and Targets

5.17 Key performance indicators for the Network are agreed and set annually with Scottish Enterprise. These have not changed significantly over time, despite refinements in 2007 and 2008 to capture more effectively the activities of the Network – see Table 5.7.

Table 5.7: SSCN KPIs	
Original KPIs (2006/07)	Revised KPIs (2007/08 and onwards)
Delivering 6 workshops per year	Delivery of a minimum of 6 workshops
Delivering 1 international conference per year	Work with general members to meet with 1 or 2 international speakers/collaborators Participation in a minimum of 4 non-SSCN events a year (at least 2 international)
Attending 2 overseas events per year	
Attending 2 non-SSCN national events per year	
Delivering 1 public outreach activity per year	Delivery of a minimum of 4 public outreach activities
Supporting SDI with up to 12 inward visits per year	Supporting SDI with 6-8 inward visits a year as part of an agreed strategic plan
Supporting Scottish Enterprise with at least 1 major infrastructure project	Supporting Scottish Enterprise in delivery of their strategic plan for stem cells in Scotland through infrastructure and collaborative projects
Supporting Scottish Enterprise with at least 1 major collaborative project	
Delivering 4 newsletters per year	Quarterly e-bulletins and 1-2 paper review documents each year
Maintaining a website, updated at least monthly	Maintain website

5.18 Following a strategic review meeting in December 2007 the following were identified as the key priorities for the Network for 2008/09 onwards:

- Supporting an effective Network, reducing fragmentation in stem cells, encouraging collaboration, training and skills development;
- Identifying funding opportunities and supporting commercialisation of stem cell technologies;
- Promoting public understanding of stem cell technology and addressing issues that could lead to public distrust;
- Promoting Scotland's stem cell expertise, infrastructure and opportunities; and
- Lobbying national and international regulatory bodies and policymakers to maintain Scotland's competitive R&D environment.

5.19 Alongside these, the Network was also tasked with developing a Roadmap to Market, which would identify the processes involved in taking a product from the research bench to commercialisation.

5.20 SSCN has met its annual reported KPI targets, particularly core indicators relating to workshops delivered; participation in non-SSCN events; public outreach activities and international trade / inward investment support (in collaboration with SDI). Delivery partners report the 2008 strategic review removed the requirement for the Network to formally report on annual KPIs. With ERDF funding, the Network has placed greater emphasis on achieving these targets, which were closely related to its previous Scottish Enterprise KPIs. Overall, SSCN has grown to become an essential component and fundamental driver of collaborative and knowledge transfer activity within the Scottish stem cell sector.

Performance Against ERDF Targets

5.21 Table 5.8 shows SSCN performance in relation to its ERDF outputs. These outputs were developed based on the number of companies active in the sector at the time of obtaining approval. Overall, the Network has directly supported 11 enterprises and 5 research networks and collaborations, meeting or exceeding its targets in these areas.

Table 5.8: Profiled and Actual Outputs			
ERDF Outputs	Total Target	Actual to September 2011	% Achieved
Number of enterprises supported	10	11	110%
Number of research networks and collaborations supported	5	5	100%
Number of new products and services developed by supported enterprises and research centres	50	4	8%
Number of new products and services developed by supported research networks	50	1	2%
Number of gross jobs created	100	29	29%
Increase in turnover in supported companies	£1,000,000	£750,000	75%
Source: SSCN			

5.22 SSCN's reported performance in relation to its commercial outputs including new products and services developed and jobs created has been modest and arguably understates its impact in these areas. This is partly related to challenges (reported by delivery partners) capturing information on new products and services developed from supported companies. A more accurate assessment of the Network's performance is presented in chapter seven, which quantifies its commercial impacts. Even so, the true impact of SSCN is arguably higher than estimated as some consultees have reported finding it difficult to quantify its impact in terms of turnover and employment due to the Network's support.

Summary

5.23 Alongside its core funding from Scottish Enterprise, the SSCN has attracted substantial external funding from various competitive sources including the ERDF and Technology Strategy Board. These have been used to support a wider range of activities and projects than it could otherwise deliver.

5.24 SSCN has been able to achieve its KPIs each year, as well as making good progress towards those targets set by other funders, such as the ERDF. Whilst it has met the activity orientated outputs, less progress has been made in relation to commercial targets as a result of perceived challenges attributing direct economic impacts to the Network's activity.

6 NETWORK BENEFITS, OUTCOMES AND EFFECTIVENESS

6.1 This chapter draws on the survey results³⁷ and interview findings to identify the ways in which members have benefited from the work of the SSCN. It also summarises their views about the effectiveness of the Network in promoting Scottish stem cell capabilities internationally and its public engagement work. The chapter synthesises respondent views about the degree to which the Network has supported the development of the sector. A summary of the SSCN's key achievements and limitations as perceived by respondents is also given.

Networking and Information Exchange

Networking

6.2 Organising events and meetings is one of the core functions of the SSCN. As well as disseminating information, these meetings provide an important forum for networking, enabling members to make contacts and develop relationships with those they may not have come into contact with otherwise. The Network's success in this area is reflected in both the survey and interview findings. Hence, 86% of survey respondents reported that the SSCN is effective or very effective in providing an opportunity to network with others involved in the stem cell field.

6.3 The interview findings suggest that a lack of time on the part of members and the Network's breadth of coverage are two key factors why they value networking opportunities. As one member reported:

Talking to the business community has been very important to me. I've got to find out what companies want. But I don't have time to go and look for the companies that I should be speaking to and so the Network's been able to tell me who I should talk to and allowed me to connect to them (Academic).

6.4 This perspective is shared across the SSCN's membership from academics to education, policy and public engagement stakeholders, as well as industry. The following quotation captures the sentiment of the majority of companies consulted:

The most useful activities for us are the various meetings and events they run because of the networking opportunities that provides. These have quickened the length of time it takes to make connections with people, which is really important to us. So instead of taking a year to connect with a company, it's taken a few weeks. For example, locally we've connected with X and Y. Internationally, the SSCN put us in touch with the Canadian Network, who then put us in touch with five, six Canadian companies. Our sales cycle runs every twelve months and so we'll be working with them in six months (Company).

6.5 A further point to highlight is that the SSCN has encouraged networking and relationship building between academics and researchers. In line with the market failure outlined in chapter three, several respondents from the research base acknowledged that the level of formal and informal interaction between them is not as high as one would expect due to a combination of competition between institutions and silo working at an individual level.

³⁷ Although 129 responded to the survey, not all of them answered every single question. Therefore, the survey results are based on numbers and percentages of people answering a particular question rather than the survey sample as a whole.

Accordingly, one of the achievements of the SSCN is that it has brought together academics and researchers from different institutions and across various disciplines, which has in turn led to both informal working and collaborative projects on occasions (see below).

6.6 The Network covers a wide range of areas and has contacts and links to a diverse group of individuals and organisations. As one respondent highlighted, this gives it fairly unrivalled knowledge about key developments taking place within the sector. It uses this knowledge and seeks to broker potential relationships between different parties: “*When you talk to them [SSCN Executive Team], they say, “x is doing this and y is doing this and you should talk to so and so. So, knowledge about activities and people just snowballs”* (Education and Training). This highlights a subtle, yet important point: the Network not only promotes relationships between the members, but between them and external organisations.

6.7 Whilst the overriding consensus is that the SSCN is effective in providing networking opportunities, there is also a demand from some members that the SSCN should be more proactive in facilitating connections between members and others. Exploiting links with international companies and researchers is an area of improvement cited frequently by interview respondents. The survey results reflect the variation in views of interview respondents. Thus, only 44% think the SSCN is effective in facilitating interaction between the Scottish stem cell community and overseas companies and researchers.

6.8 Reasons for such variations in views can be found in more detailed analysis of the qualitative data. In a number of cases, the SSCN has been able to make introductions between Scottish companies with overseas contacts, which explains why some respondents are satisfied. However, given the constraints on the SSCN’s time and resources, this has not been the experience of all members, which explains dissatisfaction amongst some companies.

6.9 It is also important to highlight variations in the expectations of SSCN’s role. Hence, whilst some academics and companies believe that the SSCN should be involved in helping make connections, a number of respondents are unclear whether the remit of the Network extends to this; a view reflected in the following quotation:

If you ask them, I’m sure they will facilitate a meeting. They are very willing to help. But they don’t have a list of companies and say you should talk to X, Y, Z. It would be fantastic if they did, but I’m not sure that’s their role (Company).

6.10 The quotation above draws attention to the underlying reasons of different views about the extent to which the SSCN is effective in making connections directly on behalf of its membership. It would appear that where connections are immediately obvious, the SSCN will facilitate them. It will also facilitate them if it is asked to do so. However, it does not have the time or resources to think about the types of collaboration that will work for individual members; instead it organises various events for these to occur naturally.

Information and Knowledge Transfer

6.11 Alongside networking opportunities, SSCN events comprise a key mechanism for disseminating information and knowledge exchange between academics, between academia and industry, and vice versa. Both the survey results and interview findings highlight the value and importance attached to this function. Thus, 83% of companies responding to the survey stated they had increased their knowledge about the type of research taking place as a result of their involvement with the SSCN. Indeed, several companies that were interviewed emphasised this to be one of the key benefits they derived from being a member of the Network.

6.12 However, it is important to emphasise that it is not just companies that appreciate being kept informed of the latest research developments, academics do too. They value

being kept informed of developments in related disciplines as well as the research taking place overseas. Indeed, the SSCN's ability to attract high profile world leading scientists to its meetings has been frequently cited as one of its ongoing achievements and one of its major strengths.

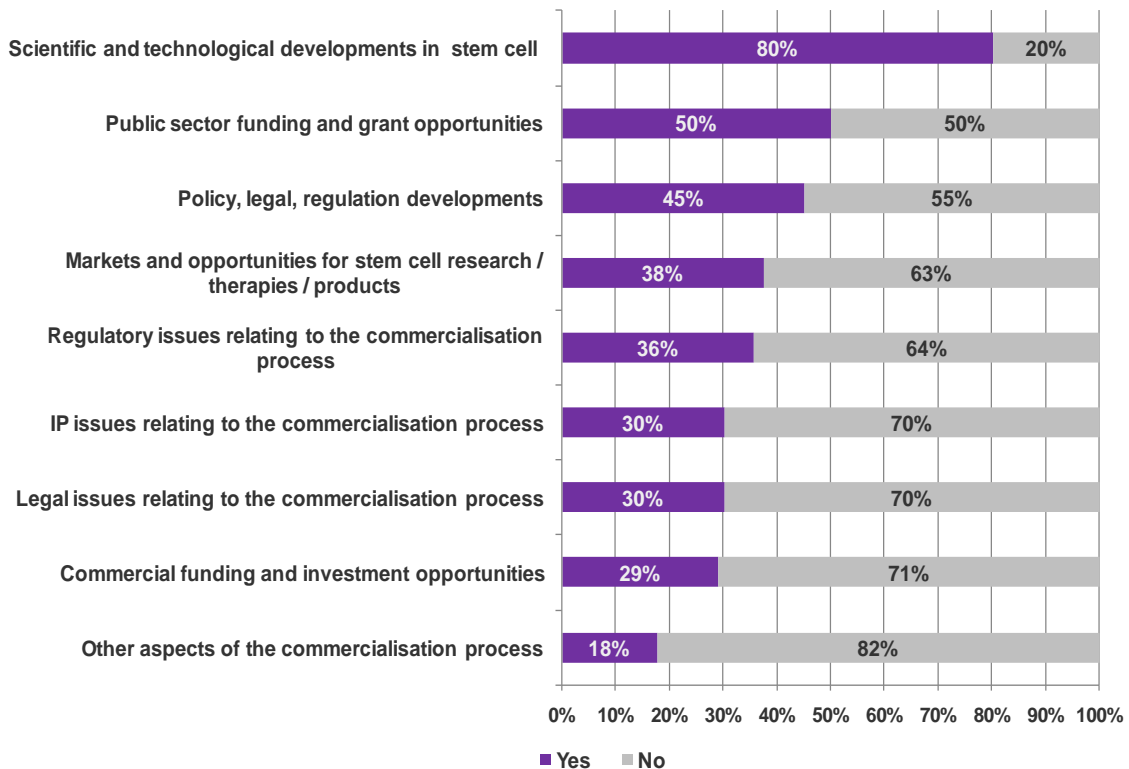
6.13 As valuable as academic research is, in line with the SSCN's shift towards a more commercial focus, SSCN events are also valued and appreciated for increasing knowledge about the commercial environment, highlighting opportunities, and the issues related to translating research to therapies. Hence, 58% of academics responding to the survey stated they had increased their awareness of the commercial environment as a result of their involvement with the SSCN. Interviews with them revealed they value SSCN events for illuminating the way in which research can be applied. Academics, used to focusing on the rigour of undertaking research, do not always understand how their work can be or has been applied outside the laboratory:

...the topics chosen go right through the regenerative medicine spectrum. The breadth is tremendous and that is very important to us as scientists. We get to hear about research and the future application of research, which is very important because sometimes as a researcher, it's hard to see where the research is going. You know, researchers sometimes don't understand how their research can be used so the meetings are very good for that (Academic).

6.14 Although the evidence shows that members turn to the SSCN to access information about the commercialisation process, as yet, they are still more likely to access information about scientific and technological developments within the stem cell field. See Figure 5.1

Figure 6.1: From the SSCN, have you accessed information or knowledge about...

Source: GEN 2011, 96 responses



6.15 Table 6.1 shows the degree to which respondents found the information they had accessed to be valuable. Hence, of the 77 respondents that accessed information about scientific developments from the SSCN, 81% found it to be valuable or very valuable. Similarly, even though only 29 respondents report to having accessed information relating to IP issues or commercial funding, 79% of them found it to be beneficial. The results seem to indicate there is an opportunity to enhance the usefulness of information relating to markets for stem cell research, regulation, and legal issues.

	No. accessing info.	% citing this as valuable
Scientific and technological developments within stem cell	77	81%
Public sector funding and grant opportunities	48	65%
Policy, legal, regulation developments	43	70%
Markets & opportunities for stem cell research / therapies / products	36	72%
Regulatory issues relating to the commercialisation process	34	68%
IP issues relating to the commercialisation process	29	79%
Commercial funding and investment opportunities	28	79%
Legal issues relating to the commercialisation process	29	66%
Other aspects of the commercialisation process	17	65%

Change in Perceptions

6.16 Limited engagement between academia and industry has been cited as one of the key obstacles undermining the commercialisation of research within the stem cell sector. In bringing industry and academia together, one would expect members to change their perceptions about the other. The survey results show that 62% of respondents believe that the SSCN is effective or very effective in promoting greater understanding between academia and industry. However, both the survey results and interview findings are somewhat more equivocal when assessing the extent to which this has led to a change in perceptions.

6.17 Focusing solely on academics, the survey results show that as result of their engagement with the SSCN:

- 59% feel more confident talking to industry;
- 53% have improved their perception and attitude towards industry.

6.18 Turning to industry,

- 78% have increased their understanding about how to access knowledge and technology from the research base
- 50% have improved their perception and attitude towards the research base

6.19 Most interview respondents believe that the SSCN has been effective in encouraging greater interaction between academia and industry. As one respondent noted, *“Before there used to be little interaction between academics and industry, but the Network has helped facilitate this; the events are crucial.”* Another academic noted:

Through SSCN, we have had very positive and constructive meetings with people in industry. It has been a revelation how open industry is to the type of interaction. The SSCN has created a common playing field where things are done together. It has opened up dialogue with industry and made it a straightforward process (Academic).

6.20 As implied by the survey results, members on both sides are now more confident and knowledgeable about engaging with the each other. Further, some of the interview respondents (both academics and companies) think the SSCN has been able to break barriers between industry and academia by, “*bringing people together in the same room*”.

6.21 At a deeper level, however, the interview findings suggest that the SSCN has not been able to break down fully the barriers between academia and industry. As one respondent remarked, these barriers are so entrenched that it is not possible for the SSCN to overcome them. Other respondents (companies and other academics) noted that the SSCN will not be able to “convert” those academics who do not wish to engage with industry. Indeed, one respondent suggested that the SSCN should refocus its energies on engaging with the “applied” stem cell sector, individuals and organisations able to support the development of ancillary technologies related to the stem cell sector.

Collaboration

6.22 Verifying the results reported upon earlier, regarding the effectiveness of the SSCN in providing networking opportunities, 67% of survey respondents reported that the SSCN is effective or very effective in promoting collaboration between different parties active in the stem cell sector. As outlined above, whilst the Network does, where possible, facilitate introductions between organisations, on the whole, collaborative projects tend not to occur because of the *direct* involvement of the SSCN. Nonetheless, both the survey results and interview findings highlight that formal collaborations, in the form of projects, have occurred through and because of the Network. Indeed, as detailed below, it is possible to make a distinction between different types of collaborative projects that have occurred as a result of the SSCN. Before examining these, it is important to draw attention to two points.

6.23 First, a strong theme emerging from the interviews when respondents talked about collaboration – regardless of which type of project was being undertaken – was that of synergy and achieving higher value outcomes. For instance, the Science Centres talked about the synergy arising from their expertise in public engagement and the scientists’ knowledge of stem cells. As one of the Centres reported, “*In working together, we’ve probably increased the longevity of the exhibition than if each of us had done this on our own.*”

6.24 Second, it is important to acknowledge that some partners have not been able to secure projects or achieve commercial gain. One such partner, however, is sanguine about this, adopting a long term position. As the company is fairly active within the stem cell/life-sciences area, it has been valuable to not only keep up to date with developments within the sector, but make the contacts with the emerging industry. In this way, the company expects to secure clients in future; and engagement with the SSCN is, therefore, regarded as “*long term planning to build a pipeline of work in future.*”

Joint Ventures

6.25 Joint ventures refer to projects pursued between members that may not have otherwise occurred. Thus, 19 members reported that they had either undertaken projects with contacts made through the Network or that projects were underway (see Table 6.2). This comprises 14 responding to the online survey and 5 consulted in-depth. A further 20 (from the survey only) are in the process of discussing a joint venture.

6.26 There is a considerable range in the values of the joint ventures, and some are high value. One company noted that SSCN events provide a forum for potential collaborators and customers. One such event led to a joint bid submitted to the Technology Strategy Board to undertake a short feasibility study related to stem cell nano-toxicology. Funding from the Strategy Board contributed to 75% of the study cost, which was £25,000. In another case, one academic respondent reported that the Network facilitated access to “industrialists” that

would not otherwise have been made. Working with one company in particular has proven to be fruitful with joint bids between them raising £250,000 from various sources. Table 6.2 summarises the total number and value of joint ventures developed and underway as a result of the SSCN.

Table 6.2: The financial value of joint ventures underway as a result of SSCN		No.
No financial value		2
Up to £250,000		5
£250,000–£499,999		2
£500,000–£749,999		1 ^a
£750,000–£999,999		0
£1m		0
Over £1m [please specify]	£2 million	1
	£2.5 million	1 ^b
	£6 million	1 ^c
Non disclosed / Don't know / Skipped		6
Total		19
^a This includes an Edinburgh based institute making an application of £0.5 million to the Medical Research Council with a contact made through the SSCN.		
^b This includes a £2.5 million secured from the SFC to fund research examining the development of industrially-generated blood; a project that included involvement of the SSCN.		
^c This includes a £6m collaboration between a Scottish and an American company and included input from the SSCN.		

6.27 In assessing the financial value of projects facilitated through the SSCN, two points need to be highlighted. First, this may under-represent the number of projects that have occurred as not all members participated in the study. Second, as reflected in the following quotation, some respondents found it difficult to attribute the financial value of projects to the SSCN because of the multiple organisations and individuals involved in putting together a project and securing funding for it. For many members, the value of the SSCN lies in facilitating the relationships that subsequently lead to projects at a later date:

It is very hard to quantify or put a financial benefit on collaboration because so many people are involved. The benefit of the SSCN isn't in pounds and pence; its benefit is long term, around facilitating collaboration. I think putting a financial estimate would underestimate the Network's real benefit. Its benefit is difficult to translate into cash. Quite a few of the projects are funded by other programmes but the Network enables collaboration which means the programmes are delivered better through greater synergy than would otherwise be the case (Academic).

6.28 As well as raising finance, networking has impacted on research too. For example, one university Department found it much easier to establish a programme of stem cell research through contact made with a quasi-commercial research institute via the SSCN. The visit enabled the Department to establish a stem cell facility, which in turn enabled it to access research funding. It is reported that the research programme “*wouldn't have come about without the contact made through the Network*” (Academic).

External Collaborations

6.29 There is evidence of two types of external collaborative projects occurring because of the SSCN. The first is between SSCN members and external organisations. For example, as

a result of a relationship facilitated directly by the SSCN, the aforementioned Edinburgh research institute is working with a Californian company to develop two projects, one related to clinical work and the other focusing on research. In the past, the Institute worked with the Newcastle Regenerative Medicine, again because of contact made through the Network.

6.30 The second (and less common) type of project relates to collaborations involving the SSCN and external partners in which expertise of the membership has been drawn upon. In the main, these have comprised public engagement and education projects. Taking the example of the *Stemming Expectation with Knowledge* project, the two Science Centres greatly valued these projects for various reasons including:

- **Undertaking the projects** – The science centres would not have been able to fund the exhibitions without the project being initiated and facilitated by the SSCN. In Dundee, the exhibition has become permanent exhibition (10 year life); whilst in Glasgow, it will become part of a much bigger exhibition to be launched in 2013.
- **Accessing expertise they would not have been able to access otherwise:** For example, the science centres were able to access research expertise they wouldn't have been able to access otherwise. *“Without the SSCN, the science centre would not have known which scientists to go to if it was going to do something similar. The value lay in SSCN identifying the right scientists and facilitating access to them. This collaboration is very valuable to us”* (Science Centre).
- **Increasing contacts and networks:** The science centres have been able to expand and develop their own network of contacts. For example, before the exhibition, Dundee Science Centre did not have a relationship with BioDundee.

Spin-Off Projects

6.31 These refer to new projects occurring because of work initially undertaken through or for the SSCN. To date, there are two such examples. For example, one of the partners in project REALISE has been able to use the methodology developed through that project and apply it to a completely different sector on a new project with another corporation. Another partner working on project REALISE has successfully received £26,000 from the Technology Strategy Fund to undertake a new project. Reportedly, this project would not have occurred without the experience gained from project REALISE and nor would it have been possible to secure funding from the Technology Strategy Board.

Benefits and Outcomes

6.32 Alongside networking benefits, which in turn have contributed to collaborative projects, survey results and interview findings identify other ways in which members have benefited from engaging with the SSCN. These are outlined below.

Profile Raising and Public Relations

6.33 The SSCN relies on its membership to help deliver events and with the implementation of projects. This not only benefits the end-users, but as became clear through the interviews, those members who are involved in delivery in some way. Primarily, companies asked to speak at conferences or events reported their profile had been raised. In essence, it comprised valuable, yet free publicity for them as captured in the following quotation:

We've given presentations at technology events, we've given talks from the perspective of a new and innovative company and we've done sessions at the ISSCR. We've also produced articles with the SSCN. This has benefited us greatly. It's basically free PR. The more opportunities you get to speak, the more your name gets out there. So it's

fantastic. Companies like ours wouldn't be able to go to some of these conferences otherwise, so it's a great opportunity (Company).

6.34 The survey results also provide evidence of some members who believe that they have been able to raise their profile because of their engagement with the Network. Thus, 45% of respondents reported their profile had increased amongst UK/international academics and 38% reported that it had increased amongst businesses (again UK/internationally).

Accessing Public Sector Funding

6.35 As a result of their engagement with the SSCN, twelve respondents sought to access research funding. Seven of them have been successful and five are yet waiting to find out about the outcome of their application. Of the seven that have been successful, four have secured funding up to £250,000, whilst one respondent has secured research funding of over £1 million – see Table 6.3. Two out of the seven respondents report that they probably would have secured the funding without the SSCN.

6.36 Five respondents have sought to access funding from elsewhere in the public sector and two have been successful. One of them has secured funding up to £250,000 and the other for over £1 million. One respondent has stated the funding would not have been accessed without the SSCN.

Table 6.3: The financial value of research & other public sector funding secured through SSCN		
	Research	Other public sector
Up to £250,000	4	
£250,000–£499,999	1	
£500,000–£749,999	0	
£750,000–£999,999	0	
£1m	1	
Over £1m [please specify] ¹	1	1
Non disclosed / Don't know / Skipped		1
Total	7	2

¹ Specified as £2 million.

New Markets, Sales

6.37 A significant proportion of business members (from both the survey and interviews) have or expect to generate new sales and/or access new markets as a result of their engagement with the SSCN.

6.38 With regards to new markets, one interview respondent noted that the company is using the expertise of the membership to “test” the feasibility of its products, examining commercial viability as well as the needs of end users. For this respondent, being able to draw on such expertise is extremely valuable as it enables the company to use such knowledge to tailor its portfolio to meet the needs of market.

6.39 The survey results show that of the 33 businesses responding to the survey, 45% stated they have accessed new markets or customers as a result of their involvement with the SSCN or expect to do so in future – see Table 6.4. The proportion who have or expect to access new markets and customers rises to close to 80% of those able to state (i.e. excluding those who don't know or did not answer).

Table 6.4: Number and proportion of businesses accessing new markets or customers as a result of their involvement with the SSCN

	No	%
Yes – achieved	4	12%
Yes – achieved <i>and</i> expect to continue doing so in future	2	6%
Yes – expect to do so in future	9	27%
No	4	12%
Don't know or did not answer	14	42%
Total	33^a	100%

^a The sample base is confined to small and large businesses responding to the survey.

6.40 Table 6.5 summarises the financial value of the new markets and customers that have been accessed to date and that expected in future. Six businesses have achieved new markets or customers to date (18% of the business sample), with two of the three saying these were up to £250,000, the other between £500,000 and £750,000. Four of the five businesses were stated the expected future value of new markets and customers at up to £250,000, another between £750,000 and £1m. In all, just under one third of the SSCN member businesses expect to derive some value from new customers and markets in the future as a result of their interaction with the Network.

6.41 A smaller number of businesses have reported actual sales to date, 3 (or 9%) of the SSCN supported businesses. This rises to 8 businesses (24%) who expect sales to be achieved in the future. The following chapter examines these data in more detail.

Table 6.5: The financial value of sales/ new markets or customers accessed / expected a result of businesses' involvement with the SSCN

Surveyed businesses only				
	Value of New Markets/Customers		Value of Sales	
	Achieved	Expected	Achieved	Expected
Up to £250,000	2	4	1	5
£250,000–£499,999	0	0	0	1
£500,000–£749,999	1	0	1	0
£750,000–£999,999	0	1	0	0
Yes but value not stated	3	5	1	2
No	4	4	9	9
Skipped or don't know	23	19	21	16
Total^a	33	33	33	33

^a The sample base is confined to small and large businesses that reported to accessing new markets or customers as a result of involvement with the SSCN, or expecting to do so in future.

Innovation Outcomes

6.42 Perhaps unsurprisingly, it is evident that the SSCN has played a marginal role in helping individuals/organisations with the development of new products or processes and/or their protection. As shown in Table 6.6, a handful of businesses have devised an intellectual property agreement, put in place some form of IP protection, achieved licenses or filed for a patent.

Table 6.6: Innovation outcomes generated through involvement with the SSCN					
	Yes	No	N/A	Skipped	Total ^a
Intellectual property agreement	4	10	11	8	33
IP Proof of principle study	4	17	–	12	33
Developed a new process or technology	3	11	9	10	33
IP protection	2	18	–	13	33
Patents (filed and pending)	1	10	11	11	33
License achieved	1	10	11	11	33
Patents achieved	0	10	11	12	33

^a The sample base is confined to small and large businesses responding to the survey.

International Promotion

6.43 Raising the international profile of Scotland’s stem cell capabilities is regarded by virtually all interview respondents as one of the SSCN’s major achievements. Again, this is endorsed by survey findings with 58% of respondents indicating that the SSCN represents the Scottish stem cell sector to overseas researchers in a positive way. Moreover, 69% of respondents believe that the SSCN is effective or very effective in *promoting Scotland’s profile on the international stage as a centre of excellence within the stem cell field*. As one respondent remarked, *“The Network’s been good at making sure all the bits of the stem cell sector are visible internationally. It’s been able to demonstrate the size and scale of research that is going on”* (Company). In so doing, interview respondents emphasised that the Network has been particularly effective in creating an impression that the Scottish stem cell sector is co-ordinated and cohesive. The following quotation captures the sentiment of most respondents:

There’s a perception that we have a coordinated stem cell research capability and SSCN has been good at creating an impression of scale and cohesion at the international level. In fact it’s done a bloody good job given the starting point and material it had to work with. But in reality, the sector isn’t coordinated. In conjunction with SDI, the Network’s been good at being able to present Scotland as a place to do research. Other networks haven’t been able to do that so well. Overall, the profile of Scotland has been raised and that is partly down to the Network (Company).

6.44 Many interview respondents also cited the invitation to host the annual conference of the International Society for Stem Cell Research as evidence of the Network’s success in promoting Scottish capabilities. This conference is regarded as the sector’s most important, high-profile and renowned event of the year. Hosting the conference is regarded as a major indicator of that country’s success within the sector, bringing with it major opportunities. As one respondent noted, *“If they get the ISSCR meeting, that will massively transform the profile of the sector in Scotland; all the best scientists will be visiting Scotland from around the world* (Academic). In putting together the bid, respondents highlighted the Network’s hard work and liaising with all stakeholders, including Scottish Enterprise and Glasgow City Council.

6.45 Interview respondents also highlighted that the SSCN itself has a very good reputation internationally and is highly regarded. This is probably due to the high quality of events it organises in Scotland and the quality of its stands and exhibitions overseas. As outlined in chapter four, it is by working with SDI that the SSCN has been able to engage in high-quality international activities – both add value to each other and it is reasonable to assume that in so doing, greater synergy and value is generated.

Public Engagement

6.46 All respondents agree that public engagement is essential as the ethical and social issues related to stem cell therapies and research could easily alienate the general public. As one respondent noted, the aim is to avoid the problems encountered by GM crops. Members are therefore keen that the SSCN engages with the general public effectively and the consensus is that it does so successfully. Thus, 68% of survey respondents stated that it is effective or very effective in promoting public understanding of developments taking place within the stem cell sector. The interview findings indicate that, in part, this is because of the sheer number of people that the Network can reach. The Science Centres, for example, reported that the stem cell exhibitions have been seen by “*thousands of people already and will continue to be seen by thousands more as they evolve*”. Their key value has been to provide an impartial and realistic overview of the science, its potential and its limitations in being able to treat medical problems to the general public, which is very interested in stem cells, yet not very well informed. More broadly, there is a view that the SSCN is supporting the development of the sector specifically through its public engagement work.

Sectoral Development

Addressing sectoral fragmentation

6.47 There is a consensus amongst interview respondents that from a strategic perspective, and in the interests of Scotland as a whole, it is important that an organisation should coordinate the activities of the stem cell sector or at least have an awareness of the key developments taking place. World leading scientists working in Scotland may be known to their peers, but to enable the sector to become more commercial and to attract investment, it is important to highlight these competencies to a wider audience and also encourage cross-sectoral collaboration within the stem cell sector.

6.48 Survey results show that 62% of respondents stated that the SSCN is effective or very effective in *coordinating the activities undertaken by various types of organisations within the Scottish stem cell sector*; and 73% believe that SSCN has helped create a stem cell community that did not previously exist. In broad terms, interview respondents agree with this. There is a consensus amongst them that the SSCN has worked hard at promoting cross-sectoral engagement by organising events, symposiums, meetings and so forth.

6.49 Interview respondents are, however, a little more equivocal about the extent to which the SSCN has been able to overcome sectoral fragmentation and create a cohesive stem cell community. The quotations below reflect the diversity of views.

Box 6.1: Addressing sectoral fragmentation

SSCN has helped create a stem cell community. There are a lot of groups and they share knowledge with each other because of SSCN (Economic Development).

The Network hasn't been able to address fragmentation, but it's assisted a degree of communication that didn't exist previously. This has led to the appearance of critical mass, but the sector is very fragmented because academics do what they want to do (Company).

SSCN works well at the local level e.g. organising progress to therapy meetings etc., but at a more strategic level, to move the sector forward, the Network fails miserably. The SSCN vision should be to unite Scottish regenerative medicine. It should work to link together all the groups for the good of Scotland and to make it a global player, but there's been too much politics involved for that to have happened (Company).

6.50 As indicated in the quotations above, there is a perception amongst interview respondents that the SSCN has made some progress in facilitating communication between

academia and industry as well as within the academic sector itself. However, its greater achievement has been in presenting the sector as more unified than it is in practice to a wider stem cell community not working in Scotland.

6.51 There are several key reasons given by respondents for SSCN's moderate success in creating a cohesive stem cell community in Scotland. The first is academic independence – they will only collaborate with other academics and/or industry if *they* want to; neither encouragement nor coercion works. The second relates to the limited *authority* of the Network and third the perception that the Network lacks effective leadership to overcome the many “egos” necessary to overcome sectoral fragmentation.

6.52 In practice, it may not be possible or indeed desirable for a sector to be wholly coordinated. The success of the SSCN lies in being extremely well networked and, consequently, having an overview of the key developments taking place in the sector. Moreover, as the evidence highlights it has broken barriers between different groups of members and provides effective opportunities for collaboration. Perhaps this is the extent to which sectoral fragmentation can be overcome and the SSCN has achieved it.

Sectoral Development and Commercialisation

6.53 Respondents are positive about the role of the Network in contributing to the development of the stem cells and regenerative medicine sector. Thus, 42% of respondents believe that the SSCN helps progress research and product processes towards a more commercial outcome, whilst 44% think the Network is effective or very effective in *encouraging and assisting with the commercialisation of research within the Scottish stem cell sector*.

6.54 The survey results are corroborated by the interview findings. There is a consensus amongst respondents that the SSCN has become more commercial in its focus over the last two years. Project REALISE was identified by virtually every respondent as a key example of the way in which the SSCN is seeking to support the commercialisation of the sector. There is much enthusiasm and optimism surrounding the tool; there is a strong perception that it will help companies take therapies to market in a field in which this is extremely difficult and complex. The tool is also identified as a tangible outcome that probably would not have occurred without the SSCN.

6.55 The Network's role in developing and submitting the TIC bid³⁸ was the second most commonly identified example illustrating the way in which it is supporting the commercialisation of the sector. Most respondents doubted that Scotland would win and bar a few exceptions, this was not attributed to the quality of the submission or the role of the Network. A few respondents noted that even though the Centre may not be located in Scotland, the *process* of writing the bid was beneficial as it, “*highlighted issues and problems about translating cell therapies that academics didn't know were problems*” (Academic). In essence, through the TIC bid, the Network was effective in getting messages across to academics about the issues businesses are interested in (e.g. scaling up, manufacturing, and making therapies safe).

³⁸ In October 2010 Prime Minister David Cameron announced investment of £200 million in creating a network of world-leading technology and innovation centers. These will be created in specific technology areas where there is a potentially large global market and a significant UK capability. The location of TICs is decided by the TSB following an open competition with bids invited from organizations that wish to work with a new centre when it opens. The first TIC, focusing on high value manufacturing, was announced in January 2011 and will be located in Rotherham. The Government wished the second centre to focus on cell therapies and the deadline for applications was September 2011. A bid to locate the TIC in Scotland was led by Scottish Enterprise and the BioQuarter with input from the SSCN and its members. At the time of writing (December 2011) a decision has yet to be made.

6.56 Several respondents cited the shift away from funding PhD students towards funding activities aligned with translational science and commercial activity as evidence of the SSCN's role in supporting the commercialisation of the sector.

6.57 The overall assessment by interview respondents is that the stem cell sector is beginning to move beyond academic research. The SSCN is seen to have played a key role in the sector's evolution, primarily by bringing together different groups (i.e. academics, clinicians, businesses). This assessment is also borne out by the survey results with 74% of respondents stating that the SSCN has supported the development of the Scottish stem cell sector. Moreover, 69% think the sector would not be as advanced as it is currently without the Network.

6.58 There is a minority view, however, that the SSCN has had marginal impact in supporting the commercialisation of research and the development of the sector. In the main, this criticism is directed at the developmental stage of the sector rather than the competence of the SSCN. Interview respondents were keen to emphasise that whilst there is some evidence of the sector entering application and clinical trials, it remains at a very, very early stage of development. In this context, a few respondents believe that commercialisation has been an unrealistic objective from the outset because much of the work remains academic and there is no known business model with which to translate research into commercial opportunity. More commonly though, respondents think that there are still opportunities to commercialise the research that has been conducted to date. Where such opportunities are to be found, is however, open to disagreement between them.

6.59 Hence, a few respondents argue that the science is not yet sufficiently developed to be thinking about therapies; instead the focus should be on the application of tools and technologies of existing research. One respondent argued that rather than seeking to obtain commercial value from projects that will enter Phase 2 or Phase 3 trials, which is some way off, the SSCN should direct its support to small biotech companies developing treatments for a relatively small population group.

Achievements and Limitations

6.60 This section summarises the key achievements and limitations of the Network as perceived by interview respondents.

Achievements

I'm delighted with the Network. They do a very good job with the resources they have and I'd like to think they will continue and even deepen their work [by broadening networking opportunities with international connections] if they got more resources. Their doors are always open and they're willing to help you in any way they can (Company).

6.61 Respondents were asked to identify the key achievements of the SSCN and there was a high level of agreement between them as to what these are. The following were identified as the main ones:

- Project REALISE, although one respondent noted that the Network should set a budget to market the tool effectively, highlighting its potential uses and benefits;
- Encouraging links and collaboration between members;
- Supporting the development of the TIC bid, including securing the input of a range of individuals;
- Having the ability to galvanise the stem cell community very quickly. For example when bidding for the international conference, it could draw on the support of key

members very quickly. Few other networks are seen as being able to achieve this.

- Work in the education sector, which many respondents were to emphasise should not be underestimated particularly since stem cells is a new field and teachers themselves lack knowledge and materials to teach the subject effectively;
- Raising the international profile of Scotland through public engagement and in so doing, providing a consistent message regarding regenerative medicine;
- Giving identity to the stem cell community in Scotland and being highly networked itself. It engages with all the institutions involved in regenerative medicine in Scotland.

6.62 More broadly, respondents believe that the SSCN offers exceptional value for money. Often contrasted to other networks, respondents agreed that the SSCN performed better than others, possibly making a bigger impact. The following quotation summarises the assessment of most interview respondents: *“For the size of organisation it is and the degree of funding it gets, the Network has made a bigger/better impact compared with other bodies with similar level of support. It’s made effective use of its resources. Part of that is due to being extremely well connected and knowing the communities well”* (Academic). .

6.63 The two overriding factors underpinning the success of the Network are seen to be the skills and abilities of the Executive Team, particularly the Director of Operations. Secondly, having a membership that is willing to engage and support activities.

Limitations

The SSCN is not broken – there is a lot of good work going on but the SSCN could do so much more; it doesn’t meet its potential ... it could be better (Company).

6.64 The following were identified as the key limitations of the Network:

- Governance arrangements, particularly the Advisory Group not being used effectively or making use of its full potential. This issue is explored in greater detail in chapter eight.
- Narrow or insufficient engagement – A few respondents believe that up to now the SSCN has prioritised engagement with academics and/or is better at networking for them compared to facilitating links and introductions for companies operating in the sector. A couple of other respondents noted that there is too much focus on biology and the Network has not spent much time trying to engage with disciplines like engineering or chemistry, which will be required to support the commercialisation of the sector.
- Insufficient exploitation of links with overseas companies and researchers;
- Too much “interdependence” between SSCN and Scottish Enterprise. It is felt that the Network should be able to liaise directly with the LiSAB and/or politicians without having to go through Scottish Enterprise.

6.65 Many interview respondents were somewhat ambivalent about the additionality associated with the Network’s activities. Few respondents were able to pinpoint developments that would not have occurred without the Network. Nonetheless, on the whole, there is a feeling that it would be “detrimental” to the Scottish stem cell sector if the Network ceased to exist.

6.66 In terms of ways in which SSCN’s limitations could be overcome, respondents believe that the Advisory Group should assume a greater role in decision-making and the Advisory

Group in turn should seek to influence LiSAB and Scottish ministers responsible for the Life Sciences. (The role and perceived limitations of the Advisory Group is detailed in chapter eight.)

Summary and Conclusions

6.67 Both the survey results and the interview findings demonstrate that most members value the activities of the SSCN. Events and the opportunities for networking together with the information and knowledge disseminated by the SSCN are two such activities particularly valued by members. In bringing together the research base with industry and other interest groups, it is evident that the SSCN has facilitated various forms of collaboration between them. Indeed, there is evidence that the research base and industry are now more confident in working together and although barriers to interaction have not been wholly overcome, good progress has been made. Further, it is important to emphasise that as well as facilitating interaction between the interest groups, the SSCN has encouraged dialogue, discussion and work within them, notably the research base.

6.68 One of the key features of the SSCN that members find particularly valuable and, indeed, underpins its success, is that it is itself extremely well networked and has an excellent overview of the key developments taking place within the sector in Scotland and internationally. This is why they turn to it for information and to facilitate connections with others. It is in this way that the Network addresses sectoral fragmentation, which in turn helps the sector operate more effectively and efficiently. Rather than all individuals within the sector trying to make their own connections, the evidence shows they save time and possibly costs by going to the SSCN.

6.69 There are several other ways in which members have benefited from their interaction with the SSCN. Some have been able to raise their profile by taking part in helping deliver key Network activities. A small number have been able to access public sector funding or expect to generate sales or access new markets. On the whole though, members value the Network for the soft, intangible benefits they experience as opposed to quantifiable outcomes.

6.70 There is a consensus that the SSCN is effective in carrying out its functions. Its events are considered to be of high quality, although members tend to emphasise its role in promoting Scotland's capabilities abroad and its recent public engagement work to be major achievements. Whilst respondents identified areas where the SSCN can enhance its performance in future, the general view is that it has contributed to the development of the Scottish stem cell sector.

7 ECONOMIC IMPACT

7.1 This chapter reviews the economic impact of the SSCN, acknowledging that this is not straightforward to do given the variety of activities supported by the Network and that for many, at an individual or organisational level, the impact may be quite slight and difficult to attribute fully or directly to the SSCN. At the same time, the large numbers that come into contact with the Network directly and indirectly – and in some cases there is a very direct relationship between the SSCN and the outcomes – mean that substantial impacts can be identified.

7.2 The impact assessment makes use of quantified data provided by businesses and organisations. Where the business or organisation stated there was an impact but was not able to state the scale of that impact, an assumed value has been assigned to that business/organisation based on the average of the known values. Both the definitely known values and the additional assumed average values are presented.

7.3 This chapter therefore seeks to estimate both those economic impacts achieved to date and those forecast in the future, and to relate these impacts to the costs of investment in the Network.

A Note on the Approach

7.4 The approach to the impact assessment work examines the benefits of the Network on individual participant companies on a case-by-case basis. Around 20% of business members of the Network have been surveyed (33 online plus 13 more in-depth, the latter focusing on those thought by Scottish Enterprise/SSCN to have derived the greatest benefits). For these businesses, the emphasis has been on identifying those impacts to date and expected that are *directly attributable* to the SSCN i.e. those that are a direct consequence of the SSCN's actions. The benefits identified by the 46 businesses surveyed online and in-depth are presented here.

7.5 The SSCN estimates that 20% of its membership is drawn from the commercial sector (small and large businesses, but also charities), which equates to 240 commercial organisations³⁹. The study has therefore consulted with 21% of the commercial sector. The impacts identified in this chapter have been presented on the basis of the 46 consulted organisations.

7.6 For businesses we have sought to identify the commercial returns in terms of sales/turnover to date and those expected or forecast in the future (businesses were asked over how many years they expected future sales benefits to last as a result of the SSCN support to date). These have been converted to jobs and GVA through the application of benchmarks since the primary research did not specifically capture data against these indicators (given the breadth of information being required of respondents). We have also sought to capture benefits that may lead to these, for example new joint ventures/investment and research funding secured.

7.7 The full range of additional research income secured as a result of Network activity is also quantified, from across the different member groups. This will not necessarily result in commercial benefits, yet in many cases the new research will progress the company, charity or institute towards the commercialisation of the research. The additional research income represents new activity for Scotland as a result of the SSCN (where this research income comes from outside Scotland), with survey data specifically capturing levels of deadweight i.e.

³⁹ Although only 84 companies are identified by member interest (Chapter 3), some of the 276 'other' interests are likely to include those with a commercial interest (SSCN).

how much of the research activity could have been secured without the SSCN. For academics, this may be additional income for their department or Institute, in terms of increased revenues. Again, where we have been able and the evidence is available, we have quantified any commercial benefits arising, or expected to arise from, their interaction with SSCN.

7.8 There are some areas where the causal link between the Network and impact is less clear and capable of quantification. This includes the educational work of the Network which may lead to future economic impact through more students and researchers entering the sector, and even less clearly, a better educated public more receptive to Stem Cell research which will help it meet its market development potential.

7.9 Similarly, important activities of the Network relating to profile and international standing, are difficult to directly quantify, yet these could bring economic benefits to Scotland. Where possible, attempts have been made to assign financial value to the benefits of this work.

Commercial Benefits to Businesses

Gross Benefits

7.10 The SSCN has played a role in supporting the majority of key commercial players in the field (those consulted in-depth are listed in Appendix 3). Three of the 33 online surveyed businesses identified increased sales (9%) as a result of support from the SSCN. The gross value of these sales is estimated at £1.26 million. This is based on an average of £400,000 per company⁴⁰. We have not grossed up this value to the full sample of surveyed businesses or the SSCN's total business membership. **Therefore, the £1.26m represents a minimum estimate of gross benefits.** These have been achieved as a result of a range of SSCN activities, notably the increased opportunities to meet other interested parties through raised profile, marketing and PR and the ways in which the SSCN has facilitated collaborative activity.

7.11 Nine businesses (27%) are expecting to realise sales benefits in the future and their total gross value is estimated to be £1.3m⁴¹. The survey evidence suggests the process of achieving future sales is already well advanced, although the majority were not able to say when benefits may be realised. Once they start achieving sales, the majority of businesses expect to achieve these for several years with the average persistence estimated to be 5.5 years (based on the duration over which businesses reported their sales increases likely to last).⁴²

7.12 Future impacts may be subject to some optimism bias given the uncertain nature of the sector and the timing of any commercialisation of research. However, 8 of the 17 companies responding to this question expect to generate new sales in the future directly as a result of their involvement with the SSCN – which at 47% of responses provided is a good return of the Network.

⁴⁰ This is based on two known values and one business stating there were impacts to date but unable to quantify for the value; for this business the average of the two known values was applied

⁴¹ For seven of the nine estimated a real value for future sales expected – two businesses stated they expected to realise sales benefits in the future but were unable to say by how much and so an assumed average was used for these two businesses (based on the seven known values)

⁴² Based on 6 valid responses; 1 x 2 years; 1 x 4 years; 4 x 7 years plus (taken to be 7 years) = 5.5 years.

Net Benefits

7.13 The following net impact analysis is *not* based on grossing up the data, given that the majority of businesses supported by the SSCN that are likely to have achieved benefits have been taken part in the study and been given the opportunity to provide sales figures. Data on the additionality of new collaborative and joint venture activity was obtained, and this was applied to the gross level of new sales, to produce a proxy for the net level of new sales⁴³. The following assumptions have been applied:

- Additionality ratios of 45% and 51% have been applied i.e. that 45% of new and 51% of expected sales would not have been generated without the SSCN (deadweight is therefore 1-0.45 and 1-0.51 respectively).⁴⁴
- Displacement has been assumed to be zero given the very discrete market of Stem Cell research.
- Leakage and substitution are assumed to be zero (although there is potential for some of the sales benefits to move outside Scotland but only where the company relocates or switches production outside Scotland).
- Multipliers have been applied at 1.47.⁴⁵

7.14 Table 7.1 summarises the gross and net sales benefits to date and those expected in the future. In all, the SSCN will generate a baseline level of £1.80m in net sales of which £0.83m is to date and £0.97m is expected.

Table 7.1: Gross and Net Impacts of Sales		
	Sales To Date	Sales Expected
Gross new sales (lower range)	£1.26m ^a	£1.30m ^b
Additionality %	45%	51%
Gross new sales less deadweight	£0.57m	£0.66m
Leakage at 0%	0	0
Displacement at 0%	0	0
Substitution at 0%	0	0
Multipliers at 1.47 ^c	£0.27m	£0.31m
Net new sales	£0.83m	£0.97m
^a based on three companies		
^b based on nine companies.		
^c From 2007\Scotland Input-Output tables for Pharmaceuticals as best fit sector		

Joint Ventures and Research Funding

7.15 The SSCN has led to significant new collaborative activity. In total, 14 academics, Institutes and businesses from the online wider survey reported that they were currently engaged in joint ventures that emerged as a result of the SSCN. The total value of such

⁴³ Half of those who said they had achieved new sales or expected to, were also involved in joint venture activities, where additionality ranged from 45% to 51% (see note 44).

⁴⁴ Based on 14 respondents reporting on additionality for value of joint ventures - 2 x 100% additionality, 4 x stating benefits would have taken longer and been of smaller value (75%), 5 x stating that some of the benefits would have been achieved and over the timescale (25%) and 3 stating that all the benefits could have been achieved at the same time without the SSCN

⁴⁵ From 2007\Scotland Input-Output tables for Pharmaceuticals as best fit sector

activity is estimated to be £5.0m. A further £8.77m was reported as achieved to date through the in-depth survey.

7.16 Of those surveyed online, 20 also plan to undertake some form of joint activity in future, and the value of this is estimated to be £7.2 million. Similarly, of those members that were interviewed in-depth, a further £0.5m in new project activity is planned sometime in future (£7.7m in total). The total value of activity to date and expected in the future is £21.47m. This total includes the contribution of SSCN in helping to secure a single £6m project and a successful funding bid to the Scottish Funding Council of £2.5m.⁴⁶

Table 7.2: Joint Venture Collaborative Activity ¹	
	Joint Ventures and Collaborative Research Activity
Wider Survey of Members to Date (gross)	£5.0m
Wider Survey of Members Expected (gross)	£7.2m
In-depth survey to Date (gross)	£8.77m
In-depth survey Expected (gross)	£0.5m
Total (gross)	£21.47m
Additionality of activity to Date	45%
Additionality of activity Expected	51%
Total (net)	£10.22m
Additional funding to Scotland	73%
Total (net) to Scotland	£7.46m
¹ Note, secured research income may also be collaborative joint venture funding; the joint venture funding values are an aggregation of the mid-point of the value ranges expressed in Table 6.2. Where actual values for the value of research income and joint ventures have been provided, these have been used rather than the mid-point of the value range.	

7.17 At least £10.22m in joint venture/collaborative activity would not have been progressed without the role of the SSCN. The composite level of additionality is 47%.⁴⁷ This suggests that, for a small number of members, it is specifically the role of the SSCN that is enabling new collaborative activity worth several £m to come forward.

7.18 Information on the source of joint venture funding (drawn from the in-depth interviews) suggests that 73% of the funding is additional to Scotland (£6.8m of the £9.27m identified). Applying this to the whole (gross) funding of £21.47m indicates that £15.7m gross additional research funding has been attracted to Scotland.

7.19 Applying the composite 47% additionality ratio to £15.7m implies £7.5m in net additional research income as a result of the SSCN (to date and expected). On the basis of three year contracts on average, this is £2.5m, sufficient to support **40.1 research staff** at an average of £61,230 including project overheads⁴⁸. This comprises considerable additional wages GVA for Scotland.

⁴⁶ Scottish Funding Council secured funding is not additional to Scotland. It would have been spent elsewhere in Scotland, although not necessarily on stem cell activity.

⁴⁷ Those stating that no new joint venture funding could have been secured without the SSCN equals 100% additionality; those stating that the joint venture funding would 'probably not' have been secured without the SSCN equals 75% additionality; for those stating they 'probably' would have secured the new funding without the SSCN additionality was estimated at 25%; and those stating that they would have secured all the new funding without the SSCN then additionality was 0%.

⁴⁸ The 2009 Scottish Annual Business Statistics (<http://www.scotland.gov.uk/Resource/0038/00386197.pdf>) gives a figure of £61,230 for the total labour costs per employee in Scientific Research and Development

Strategic Added Value: New Markets and New Activity

7.20 A range of new activities have been supported and some of these will have a commercial value, although again it has been difficult to quantify these. This includes the value of IP protection and the value of attracted and retained staff. In all, for example, 74 members stated that the SSCN had helped them to retain talented staff and this will translate into academic and professional employment retained in Scotland as a result of the Network (reflected in the 58.2 research posts secured as a result of the SSCN).

Events and Education

7.21 SSCN has hosted a number of events and these have attracted members from outside Scotland. A proportion of those coming to Scotland would not have done so without the SSCN, bringing additional financial benefits to Scotland in terms of their expenditure alone. Although this is difficult to quantify, the number of additional visitors to Scotland as a result of the Network may run to many thousands.

7.22 The SSCN has organised events that have brought additional visitors and income to Scotland. These include the SCRM launch and the Select BioScience conference of 2008. Some of these benefits are attributable to the SSCN. Although some would have visited Scotland independent of the conference, the majority of those attending will be doing so specifically to attend the event. These are substantial benefits for Scotland – aside from the value of research and sales which may be generated as a result of new joint project activities.

7.23 The long-term benefits of raising the public profile and understanding of Stem Cell research is very difficult to quantify. This may in time translate into greater levels of patient participation and awakened interest in working in the field. Whilst less capable of quantification, the activities are no less significant. Many of those consulted in the study highlighted the longer-term impact of such educational outreach work in changing perceptions of the potential of Stem Cell therapies.

Summary Gross and Net Impacts

7.24 The following table highlights the economic benefits arising from the Network. Levels of additionality were only identified for new collaborative activities, however this is a useful proxy for application to new sales.

	Gross	Net
New Sales to date	£1.26m	£0.83m
New Sales expected in the future*	£1.30m	£0.97m
Total New Sales	£2.56m	£1.80m
New joint venture activity	£21.47m	£10.22m
New research secured (subset of the above)	£4.9m	n/a
Additional research income in Scotland	£15.7m	£7.5m
Net research jobs supported by the above	n/a	40.1
New Markets and Customers	£15.1m	n/a
IP etc.	n/a	n/a
Events	£2.0m ¹	n/a
Education	n/a	n/a
¹ minimum estimate		

Net Impact Profile

7.25 Profiled over time, the impacts are estimated to be as follows:

Table 7.3: Profiled Net Impacts over Time								
	To 2011	2012	2013	2014	2015	2016	2017	Total
Total New Sales £m	0.83	0.16	0.16	0.16	0.16	0.16	0.16	1.80
Additional research income in Scotland* £m	4.9	0.82	0.82	0.82	-	-	-	7.5

*indicates circa one third of the net additional research income was secured in 2011 and will continue for 3 years.

GVA and Employment

7.26 The net commercial sales benefits of £1.80m and £7.46m net additional research income equates to £9.26m net additional organisational income. This is set against Scottish Enterprise investment in the SSCN of £1.6m since 2006/2007 and £2.34m public investment overall, when other public sector funding sources are included. For the pro-rated Scottish Enterprise investment (68% of the total public sector investment) this equates to a £6.26m net additional income, of which £1.22m is due to additional sales and £5.03m due to additional research income.

7.27 This is the additional income generated specifically from the existence of the SSCN and not from any of the other Scottish Enterprise supported investment in the Stem Cell and life science sectors. There is clearly a significant level of new funding for applied research that has been secured as a result of the Network which, aside from the wages, may lead to future commercial benefits.

7.28 Using net sales and research income to estimate GVA and employment, based on 68% of SSCN benefits being attributable to Scottish Enterprise support, provides the following:

GVA from the Additional Sales

- £1.22m of net sales arising from SE investment in SSCN equates to £0.44m additional GVA, based on a ratio of 0.36 between GVA and turnover in the Scientific Research and Development sector in Scotland in 2009⁴⁹;
- Additional GVA of £0.44m equates to 10.24 FTE jobs created and expected as a result of the SSCN⁵⁰; plus

GVA from Additional Research Income

- £5.03m of net additional research income arising from SE investment in SSCN equates to £1.68m per annum over a three year period;
- Additional research income of £1.68m per annum equates to 27.4 FTE jobs per annum (82.2 FTE job years in total) created through the research income secured as a result of SE investment in SSCN⁵¹.
- This provides a gross GVA from the research income of £3,530,536 based on gross GVA per employee of £42,960.

⁴⁹ Scottish Annual Business Statistics 2009, SIC 72 pg 47

⁵⁰ Based on a GVA per FTE of £42,960 (Scottish Annual Business Statistics, SIC 72)

⁵¹ Based on Total Labour Costs per employee of £61,230 (Scottish Annual Business Statistics, SIC 72)

7.29 The following table presents a summary of the net impacts.

Table 7.4: Net Additional GVA (to date and expected) – summary impacts from the Scottish Enterprise investment	
	Net
GVA from New Sales	£0.44m
GVA from Additional Research Income	£3.53m
Total GVA	£3.97m
Employment generated by Sales	10.24
Employment generated by Research Income	27.40
Total Employment	37.64

Economic Impact Ratios

7.30 Expressed as the economic impact in return for the Scottish Enterprise investment of £1.6m, the following are derived:

- Net Additional GVA in return for Scottish Enterprise investment of 2.48 to 1; and
- Net cost per FTE job of £42,508.

Optimism Bias

7.31 No specific metrics were collected on the potential over-estimation of future impacts to inform the likely scale of optimism bias. It is likely some of the estimated future sales benefits will not materialise, similarly some of the expected future additional research income. Experience suggests that this level of over-estimation may be in the order of 20%. In all, 54% of the additional sales are expected in the future, and 36% of the additional research income. Adjusting these future impacts downwards by 20% implies a net GVA from new sales of £0.39m and net GVA from additional research income of £2.83m. This is a composite net additional of GVA of £3.22m (and an economic impact ratio for Scottish Enterprise investment of 2.01 to 1).

Summary Remark

7.32 The economic impact analysis is the widest survey of those involved in Stem Cell activity undertaken to date, covering 180 members from the whole range of different user groups. The analysis suggests that the SSCN – regardless of other Stem Cell interventions – is itself generating a positive return from Scottish Enterprise’s investment. A relatively small number of members are deriving commercial and research benefits from their involvement in the SSCN but these benefits can be substantial. The economic benefits in the future can only increase as the additional research secured with the help of the SSCN likely to translate into future commercial success albeit that some of this activity will still be a number of years downstream.

8 GOVERNANCE AND FUTURE DIRECTION

8.1 This chapter begins by presenting respondents' perceptions about the effectiveness of the SSCN's governance arrangements. It then provides an assessment of the current and future developmental stage of the sector and the implications this raises for realising economic and health benefits. The future role of the Network is also explored. Finally, the chapter sets out the funding options available to the SSCN post December 2012 and some of the limitations associated with them.

The Suitability of the Governance Arrangements

The Executive Team

8.2 There is a consensus amongst respondents that the success of the SSCN can largely be attributed to the Executive Team, which is considered to be very hard working. The following comprise the most commonly cited qualities that are perceived to underpin the effectiveness of the Executive Team in discharging its functions:

- Having a fairly detailed overview of the sector, especially in Scotland, and an understanding of the needs of both academics and business;
- Being skilled at partnership working as well as being skilled in brokering relationships between members and with external organisations;
- Being responsive to member needs and organising activities that address these (as opposed to repeating those that have been delivered previously);
- Being approachable and willing to be helpful.

8.3 Overall, the Executive Team is considered to be passionate about and highly committed to the development of the Scottish stem cell sector.

The Role of the Advisory Group

8.4 All interview respondents commented upon the change in the composition of the Advisory Group, which now includes much greater representation from the private sector. Most respondents regard this as a positive development, noting that it reflects the Network's shift in focus from academic research towards its translation and commercialisation.

8.5 A few respondents noted the way in which the role of the Advisory Group had also changed from one concerned with meeting the targets of funders to one dominated by securing financial sustainability. Several interview respondents regard this as somewhat problematic. There is a perception that recent meetings have devoted too much time as to how the Network will be funded post December 2012 instead of concentrating on identifying its 'mission' and the way in which this should be achieved. As one member of the Advisory Group noted, "*The Network should stop focusing too much on where it is going to get funding from; this will follow once its decided what its mission is*" (Company). Another noted, "*In the early days, the Network was fairly dynamic. Now it is too commercially led in the sense that its focus is too much on how to raise funding and provide value for money. Penny pinching has become the mind-set of the Network; it is becoming small minded and beginning to talk about balancing accounts and not about its role*" (Academic).

8.6 Respondents also identified other weaknesses with the Advisory Group. Whilst greater private sector representation is welcomed, there is a feeling that it has now become too large; that it does not "*have a strong voice*" and that a significant proportion of members contribute little to the discussions.

8.7 Of these issues, the biggest cause of concern centres on the very strong perception that the Advisory Group is not consulted on major decisions; instead they are presented as

fait accompli. In the words of one respondent, *“The Advisory Group has got some very entrepreneurial people, but it always seems like the Board is thought of as an afterthought. It is not consulted; it has very little say in the way the SSCN is going or setting its strategic direction”* (Company). Another company noted, *“The Advisory Group doesn’t get feedback from the [main] Board and is not consulted on key decisions. I don’t think we leverage enough of the expertise in the Advisory Group to its fullest potential. I’m not sure that the Advisory Group is listened to.”*

8.8 Several respondents identified submission of the TIC bid as an example of where the expertise of the Advisory Group had not been optimised fully. Whilst the bid included input from individuals, there is a perception that it was put together without the involvement of the Advisory Group as a whole.

8.9 Three key barriers are seen to account for the contribution of the Advisory Group not being optimised fully:

- The SSCN Executive Team engages with a “favoured” group of academics and companies; in effect, there seems to be an internal clique within the Network making decisions;
- The SSCN does not engage with politicians and those responsible for setting policy for the life-sciences sector. There is a perception that is because Scottish Enterprise acts as a gatekeeper.
- The Advisory Group itself is not sufficiently proactive with discussion dominated by half a dozen or so members;

8.10 Some respondents were keen to identify where the Advisory Group could add value by identifying its potential role. This includes promoting the stem cell sector to the Scottish Government and highlighting the opportunities available in the sector internationally. There is a feeling amongst some members that the Advisory Group and the Network is not engaging with the key decision makers in Scottish Government and that this is undermining the development of the sector, *“We should be saying to Government about how fantastic the stem cell sector is. But the problem is that there is a lack of vision and a lack of will; this is the blockage stopping the Network and sector moving to the next level”* (Company.)

Strategic Direction

The Stem Cell Sector and Future Opportunities

8.11 In assessing the current position of Scotland’s stem cell sector, two strong messages emerged from the interview respondents. First, there is unanimity that, at this point in time, Scotland is one of the leading destinations in the world for stem cell research and commercial opportunity. As one respondent noted, *“Scotland has the potential to be the gold standard in stem cell technology; in fact it has the potential to set the standard and become the gold standard.”* However, there is anxiety that Scotland could lose its competitive advantage without ongoing public sector support.

8.12 The second message relates to the current developmental stage of the sector. Respondents continually emphasised that the *“sector is very much in its infancy”* (Company), although there is some disagreement as to whether this means the science is or is not yet in a position to offer credible therapies and drugs.

8.13 Some respondents believe that as the science is not yet fully developed, the focus should be on developing appropriate tools and technologies rather than focusing on *“therapies and drugs and the commercial value that can be obtained from them. ... We are focusing too much on the end game and we need to plug away at the gaps in the middle first”* (Company). Other respondents, whilst agreeing that the sector is at an early stage of

development, believe that the science is sufficiently developed, “to develop therapies from what we know now” (Company). Regardless of which position is taken, there is a consensus that it will be several years, if not decades, before treatments and commercial return can be obtained from stem cell research.

8.14 Respondents acknowledge that, in a climate of fiscal austerity, the Scottish Government is facing some difficult decisions as to the areas it will continue to invest in. There is an underlying anxiety amongst respondents that the stem cell sector may be one of the casualties of any future funding reductions. However, they firmly believe that the Government should maintain support for the stem cell sector. As one respondent noted, “It would be illogical of Scottish Government not to invest in the sector any more. The sector needs about £100m over the next 10 years to take advantage of Scotland’s competitive advantage.” As well as continuing to fund the Network, some respondents identified other ways in which Scottish Government could support the future development of the sector:

- Introduce similar funding schemes as the Technology Strategy Board but insist these be accessed by joint bids because of the synergy that can be achieved from harnessing the knowledge and expertise of two or more organisations;
- If the TIC bid is unsuccessful, create a similar Centre in Scotland to act as a second hub in the UK;
- Encourage transfer of knowledge from industry into academia, changing the prevailing mindset that “everything innovative occurs in the university sector”.

8.15 The underlying premise of respondents is that it is possible to secure commercial value from the stem cell sector, but this will not happen for some time. In the meantime, the Scottish Government needs to ensure the infrastructure is in place to take advantage of the opportunities when they arise. Some respondents believe that these will emerge by attracting big pharma whilst others believe that these will come from SMEs. The following quotations summarise the positions of most interview respondents.

Box 8.1: Maintaining Long-term Public support for Support for the Stem Cell Sector

“We need to keep our nerve and not focus on the short term; the gains will come, but not for a while yet. This should not mean that we stop investing in the sector. We need to be ready for the uptake with the right mix and infrastructure” (Economic Development).

“Tangible economic growth in the form of employment and its spin offs is still a number of years away in the stem cell sector. We have to be realistic. We will get some economic impact in the short term, but it’s only in the long term when major benefits will occur. So we need to continue to maintain our coordinated approach” (Economic Development).

8.16 Given that major economic benefits are likely to be realised in the medium to long term (i.e. between 5–10 years), some respondents believe that the Network has a pivotal role to play in delivering therapies to the clinic.

Future Direction of SSCN

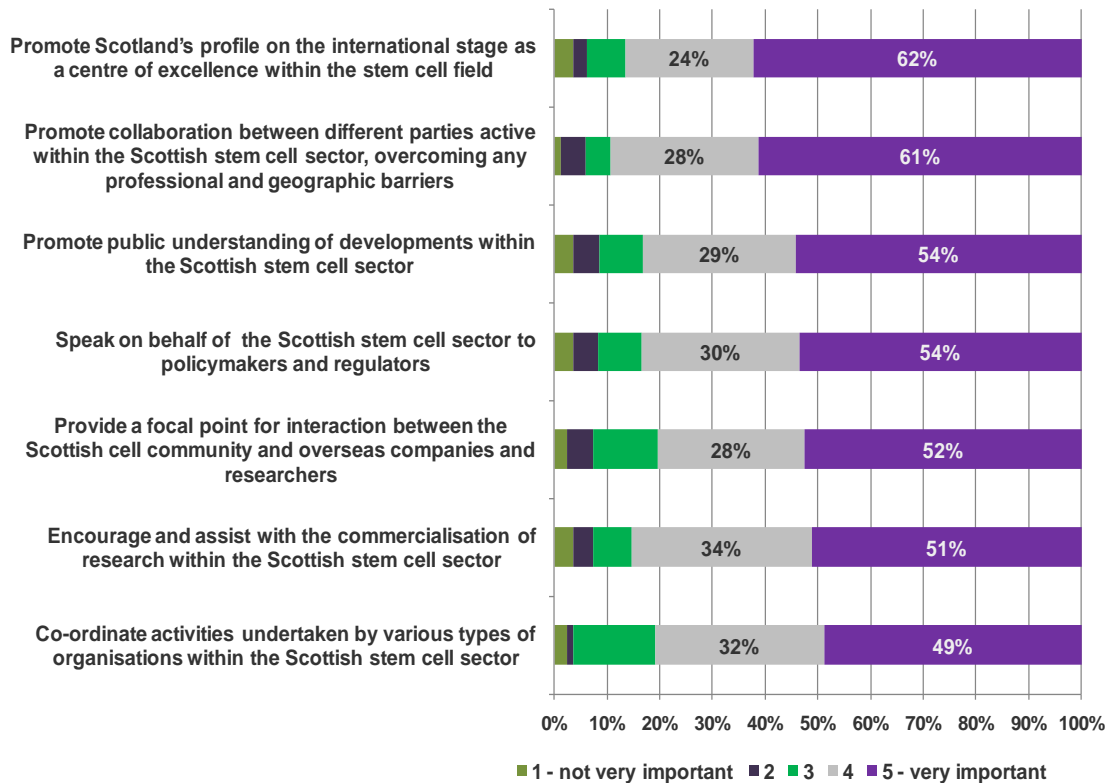
8.17 The survey was designed to assess the extent to which respondents feel there remains a need for an organisation to deliver the seven key functions, all of which are currently undertaken by the SSCN. From these responses, it can be inferred whether there is a demand for the Network to continue and, if so, which functions are considered the most important.

8.18 The survey results show the vast majority of respondents believe it is important for Scotland to continue to have an organisation such as the SSCN. Overall, all of the functions it currently performs are considered to be important or very important – see Figure 8.1. Of

these seven, promoting collaboration is seen to be the most important, followed by promoting Scottish capabilities internationally. As reported previously, the SSCN is regarded as performing both functions effectively, suggesting that members may experience some loss should the SSCN cease to exist.

Figure 8.1: How important is it that there is an organisation that is able to...

Source: GEN 2011, 88 responses



8.19 The qualitative data validates the survey results with interview respondents reporting that the SSCN should continue to organise networking events, promote collaboration, and provide a response to policy makers and regulators as and when appropriate. However, the interview findings also highlighted three key themes not immediately apparent from the survey results.

8.20 First, in arguing that the Network should continue to promote collaboration, several respondents emphasised (once more) the importance of facilitating links between industry and academia to ensure the sector exploits fully its emerging commercial opportunities. There is a consensus that Scotland (like the rest of the UK) is not as successful in taking research to the market partly because, as one respondent put it, *“businesses don’t understand academic issues and vice versa”*. In light of this, many respondents believe that the SSCN should continue to act as an effective broker between the two precisely because it is able understand the perspective of both. Indeed, one respondent argued that no other organisation within Scotland’s stem cell sector can fulfil this role. Nor can it be left to the market because SMEs do not know how to access research from universities, whilst, *“universities are not good at engaging with business. In effect, SSCN is fulfilling a public good. If you add up the cost of all the activities that SSCN undertakes, it would not be cost effective for a single private sector organisation to do it; nor would it wish to”*.

8.21 Another respondent, whilst agreeing with the proposition that the SSCN should promote collaboration, suggested that instead of brokering links between academics and

industry, it should work with and promote collaboration within the *applied stem cell sector* on the basis that some academics are not interested in commercialisation.

8.22 The second theme that emerged from discussions about the future role of the SSCN centres on the outcome of the TIC bid. There is a sense that public support for the sector is currently at a juncture. Respondents noted that the outcome of the bid will influence the future strategic direction of the Scottish Government about whether to continue to invest and support the sector, which in turn, will influence the future role/existence of the sector.

8.23 Finally, the following suggestions were made as to the future direction the SSCN could take. The SSCN should:

- Raise the profile of companies active or beginning to emerge in the Scottish sector, actively promoting them for their commercial success as well as highlighting the capabilities available in Scotland;
- Engage directly with MSPs and people who make decisions about life-sciences sector;
- Exploit the links made with international companies and researchers, as well as establish links with Korea, China and India.

Funding Options

8.24 The interview findings reveal a very clear reluctance on the part of members to contribute to the cost of the SSCN. Academic members argued that the university sector is experiencing major cutbacks and as one respondent noted, they will not pay for an organisation that is focused on networking and commercialisation and is not a “*learned society*”. Members from the private sector were more willing to consider the possibility of making a contribution, but argued that in doing so they would need to secure direct benefit in some way.

8.25 However, it is unrealistic for the SSCN to set itself up as an organisation able to deliver direct benefits to members. As the survey results show, few have experienced tangible or financial benefits from being a member of the SSCN, a phenomenon which is common to most networks.

8.26 Interview findings about the unwillingness of members to make a financial contribution confirm the work undertaken by Network’s Executive Team who explored the following funding options:

- **Membership fees** – The Network is unable to raise sufficient funds from membership fees to cover its cost of operation, which are about £500,000. If the membership fee is pitched been £25–£50, it will cost more to collect than it will raise.
- **Company sponsorship** – Whilst this can potentially generate between £60,000–£70,000 per annum, it takes a lot of time and energy to do so and any funding raised is often conditional. Nonetheless, the Network is extending its target market for sponsorship and trying to secure funding from insurance companies for example.
- **Charging for meetings** – The Network has determined that it can charge up to £50 per person for a meeting although the majority of its meetings are free to members. For the Progress to Therapy 2012 Conference pricing will be between £180 and £270 depending on whether delegates take advantage of the lower priced early bird option or not. It is expected that there will be 250 delegates plus 12 exhibitors each paying an average of £2,000 . Pricing has been market tested

against similar sized meetings and SSCN expects to recoup its costs of £40,000 for this event.

- **Consultancy work** – The Network could generate an income from project REALISE or by developing materials for projects delivered to schools. However, in the case of the former, new skill-sets will need to be introduced and in the case of the latter, the market is reported to be crowded and opportunities for a niche science topic are not as high for other subjects. Furthermore, the SSCN is reluctant to engage in such activities as there is fear that it will become a consultancy and cease to be a *network*.

8.27 The Network's Executive Team has concluded that the SSCN cannot exist without a core level of public sector funding. From interview respondents too, there is a fairly strong call for Scottish Enterprise (or another public agency) to continue to provide core funding. A few respondents made the following argument: If the stem cell sector is seen to support economic recovery, then there is a need to fund the SSCN because the Network supports the development of the sector. If investment in the sector declines, then Scotland will lose its competitive advantage. If Scottish Enterprise removes its support post- 2012, "*the investment that has been made up to now will have been wasted*".

Summary and Conclusions

8.28 There is a perception amongst members that Scotland has a competitive advantage in the stem cell field. They are passionate about, and highly committed to, the development of the sector. This attitude runs across the different interests and member commitment can be seen in the way they contribute their time and expertise to SSCN's events and projects, as well as participating in the Advisory Group. Indeed, the SSCN has been able to discharge its functions successfully precisely because it has drawn upon the expertise of its members.

8.29 However, it is evident that there is dissatisfaction with the way in which the Advisory Group is currently operating. There appears to be a need to reconfigure its composition and remit. Essentially, it should be reduced in size and given a greater role in decision-making and setting the strategic direction of the Network.

8.30 There is anxiety amongst members that in a climate of fiscal austerity, the Scottish Government may choose not to continue investing in the stem cell sector. However, they believe that economic and health benefits will be realised (faster) with public support. Against this context, there is demand for the SSCN to continue as members believe it has a pivotal role to play in supporting the delivery of therapies to the clinic and the wider development of the sector. However, for the Network to continue post December 2012, the evidence suggests that some public funding will be necessary. Alternative funding options are not viable solutions to support the Network's core activities.

9 MAPPING SSCN

9.1 This section locates SSCN within the Scottish and UK stem cell community, and assesses its relationship with international networks. It highlights SSCN's unique selling points and its complementarities with other networks.

A Scottish Player

9.2 SSCN's position in Scotland can be considered from two perspectives. First, as a crucial component of the SCIF, it is instrumental in developing an internationally recognised stem cell sector in Scotland. As discussed in previous chapters, stakeholders are largely in consensus that the Network has successfully raised the profile of the community on a global scale. Second, SSCN is one of a number of interventions that support the development of the stem cell/regenerative medicine sector.

Scottish Enterprise's Stem Cell Intervention Framework (SCIF)

9.3 SSCN is a key component of the SCIF, which addresses the infrastructure, funding, people and promotional requirements necessary to maximise Scotland's opportunities in stem cell research (see chapter 3 for an overview of the SCIF). Through these four themes, the Framework corrects market failures associated with the development of the stem cell sector in Scotland. SSCN is concerned with the 'people' and 'promotional' themes and addresses market failures involving information deficiency and a lack of cohesion particularly within the academic community, including the links with industry. There is a consensus amongst respondents that the Network acts as the overarching body supporting the delivery of the Framework and has been instrumental in the development of its four themes. As one respondent noted, "Without SSCN the different elements of SCIF would operate in silo, SSCN has integrated different partners'."

Scottish Life Science Interventions

9.4 SSCN sits amongst a plethora of other organisations and networking initiatives supporting the Scottish life sciences sector. The primary players are listed in Box 9.1.

Box 9.1: Organisations operating in the Life sciences	
Nexus	Life Sciences Scotland Aberdeen (LSSA)
BioDundee	Scottish Universities Life Sciences Alliance
the BioIndustry Scotland (BIA)	Scottish Bioinformatics Forum
Scottish Life Sciences Association	Generation Scotland
Edinburgh BioQuarter Development	Scottish Academic Health Sciences Collaboration
Scottish Imaging Network (SINAPSE)	The British Pharmaceutical Association Scotland
Life Sciences Advisory Board (LiSAB)	

9.5 Table 9.1 maps the activities of the SSCN against these organisations across five domains: funding, geography, sector focus, membership structure and activities. Whilst BioDundee, Nexus and BioIndustry Scotland are the most similar in structure and to some extent activities to SSCN, consultees reported SSCN has a number of unique attributes that differentiate it from the former two organisations. For instance, they identify SSCN as the only network in Scotland whose role and remit exclusively covers the stem cell sector, which is widely regarded as being sufficiently specialised and of significant economic and social value to require a specialist networking body.

9.6 Alongside its specialist focus, consultees also stated the SSCN engages in activities not widely undertaken by other networks, such as its education and skills development projects (chapter 4 reviews the Network's activities). Its strong focus on forging collaborations with international networks also distinguishes the Network from others. Stakeholders

reported that the SSCN is instrumental in promoting Scottish stem cell capabilities, including the Scottish Centre for Regenerative Medicine, which is one of only a few facilities in Europe that is able to progress research on all types of stem cells into clinic through a GMP facility.

9.7 The comments below illustrate what members perceive to be the unique features of the SSCN.

Box 9.2: SSCN's USP
<i>SSCN is a standalone network. It is distinct from other networks because of its geographical focus; there is a very Scottish dimension to SSCN.</i>
<i>The focus and engagement of SSCN with academics is one of its USPs. Other networks don't have that much impact on academics... they tend to focus on industry.</i>
<i>SSCN focuses on progress to therapy which other networks are not involved in.</i>
<i>SSCN is quite valuable and gives a distinctive brand to the Scottish stem cell sector.</i>
<i>Nexus and BioDundee are generalist bodies that would not be able to do anything in the stem cell field. We need a specialist network.</i>

9.8 All networks organise workshops and events. The SSCN has organised a number of events with other networks. There may be opportunities to exploit this further in future to reduce the costs of each network.

Table 9.1: Mapping Profile													
	Governance	Funders	Geography	Sector	Membership	Services/Activities							Other
						Workshops/Events	Public outreach	Science Education	Industry/Academic Collaborations Commercialisation	Inward Investment	International Collaborations	Skills and Training	
SSCN	Not for profit organisation	Scottish Enterprise, European grants, private grants, income from activities	Scotland	Narrow focus on stem cells & regenerative medicine	Membership based – largely academic	X	X	X	X	X	X	X	Industry Technology Awards (£5K)
Nexus	Not for profit organisation	Scottish Enterprise, HEIs, European grants, EST, NHS, LA	West of Scotland/ EST	Wide focus on life sciences	Membership based – mainly industry	X			X				Annual life sciences awards, Nexus Bioscience Club
Bio Dundee	Partnership	LA, UoD, European grants, Scottish Govt	Dundee	Narrow focus on Biotechnology	No	X			X	X		X	Annual BioDundee conference
Scottish Life Sciences Association	Trade Association			Bioscience	Membership based – mainly industry	X			X				Strong lobbying role

9.9 For the most part, the underlying remit of SSCN and other Scottish networks is similar. All aim to encourage collaboration and networking amongst different interest groups, although SSCN is one of the few networks that engages both academics and industry.

9.10 All networks seek to raise the profile of the Scottish life sciences industry, with Nexxus representing the interest of the industry as a whole, the SSCN focusing on one specific component (stem cell), and BioDundee focusing on Biotechnology. Nevertheless there is some overlap between them in relation to profile raising and attracting inward investment. There is arguably scope for the networks to collaborate more closely around these areas.

9.11 Overall, the networks have comparative strengths in different areas. For example, because of their industry focus, Nexxus and BioDundee have established strong relationships with companies in the sector. SSCN is perceived as having expertise in accessing funding from external organisations, skills the other networks would find beneficial.

9.12 Life Sciences Scotland aims to bring all Scotland's life sciences activities under a single overarching brand. It offers the networks opportunities to lower operational costs through joint delivery of events, whilst reducing confusion and ambiguity around their different roles.

Summary

9.13 Essentially, the member interviews reveal there is some overlap between SSCN and other networking initiatives, particularly Nexxus. There is, however, consensus that the degree of complementarity far outweighs any overlap. Whilst, there is merit in joint delivery of some activities (for example events and workshops), the remit of each organisation is sufficiently different to justify continuing as separate entities. This view is underpinned by the following comment from an interviewee: "*Some of SSCN services could be provided by Nexxus, however it is useful to have a specialist network focussing on stem cells to build expertise in the sector.*"

A National Outlook

9.14 The SSCN is recognised as one of the first UK networks established to support the stem cell sector. Since its creation in 2003, five further networks have emerged across the UK. These are:

- The UK National Stem Cell Network (UKNSCN);
- The North West Stem Cell Network (NWSCN);
- The London Regenerative Medicine Network (LRMN);
- The North East Stem Cell Initiative (NESCI); and
- The East of England Stem Cell Network (EOESCN).

9.15 As its name suggests, the UKNSCN has sought to be the overarching body for all stem cell related networks in the UK. It was established in 2006 as a response to one of the recommendations of the Pattison Report which stated, "*the Government should allocate additional funding to establish the UK Stem Cell Cooperative, to maximise the cross-fertilisation between those involved in the sub-disciplines of UK stem cell research*". UKNSCN sought to improve the collaboration of research activities in stem cells and speed up translation of research into therapies. As the national network, UKNSCN also sought to work with the regional networks and SSCN to deliver locally relevant events. For example, UKNSCN and SSCN delivered a stem cell public engagement event in Edinburgh in February 2011. However, due to a lack of funding renewal, the UKSCF was closed down in December 2011.

9.16 Like the SSCN, the regional networks in England have focussed on bringing together researchers in the area of stem cell, and a few have emphasised the translation of research as one of their core objectives. There is no real overlap between the activities of the SSCN and the others, as each is focused on a specific geographical area. Moreover, as with the UKNSCN, some of the regional networks have now ceased operating due to the abolition of the English Regional Development Agencies (RDAs), which were their primary funders.

9.17 Table 9.2 provides an overview of the status of the main UK stem cell networks.

Table 9.2: UK Stem Cell Network			
Network	Year established	Main Funders	Status
SSCN	2001	Scottish Enterprise	Active
London Regenerative Medicine Network	2005	London Development Agency, private companies	Active
East of England Stem Cell Network	2005	Previously East of England Regional Development Agency	Closed down
North West Stem Cell Network	2008	Previously North West Regional Development Agency, Advantage West Midlands	Re-organised into Mercia Stem Cell Alliance covering North West and West Midlands
North East England Stem Cell Institute	2005	Durham University, Newcastle University, One North East	Active
UK National Stem Cell Network	2006	Medical Research Council, Biotechnology and Biological Science Research Council, Engineering and Physical Science Research Council, Economic and Social Research Council	Closed down

9.18 The SSCN is regarded as the most active of all the UK stem cell networks. Further, with the future of some of the UK networks in doubt (a few are already defunct), some stakeholders perceive there is a potential role for SSCN to widen its remit and increase its representation across the UK. One respondent noted, “SSCN has fulfilled its function in Scotland and its heritage makes it well placed to support a national network.”

9.19 Respondents perceived the abolition of the RDAs have made the future of some regional networks uncertain, and challenged the notion of having regional networks at all. They also suggested creating a national Technology Innovation Centre undermines the original rationale for having regional networks and makes it more imperative to have an effective, independent and sustainable national network.

9.20 Consultees also highlighted a general lack of effective lobbying at a national and European level in stem cells. This is an area that many perceived as lacking across all the networks. There are also concerns that these developments have undermined investor confidence in stem cells being an attractive investment opportunity which will arguably make it more difficult to obtain funding for translational activity.

Summary

9.21 The national landscape has changed substantially since SSCN was first established, bringing a number of challenges but also opportunities. The research uncovers wide consensus among stakeholders of the need for an effective national network, with a strong lobbying voice nationally as well as internationally. Some perceive SSCN as being well-

placed to extend the remit of its activities, in part because of its heritage and success to date. Clearly, this would require sufficient financial resources as well as a change in the remit of the Network.

A Global Remit

9.22 SSCN is one of the founding members of the International Consortium of Stem Cell Networks (ICSCN), established in 2005. The ICSCN is a network of national stem cell research organisations, with eighteen members. It works to accelerate stem cell research globally by providing a forum for exchange of best practice and the development of successful national initiatives through cross learning.

9.23 ICSCN members work together to deliver joint events. For example, an annual international symposium for junior researchers and late stage doctoral students is organised by the ICSCN, which facilitates the exchange of researchers between members. The ICSCN also delivers international workshops, around areas where expertise in any one network area may be limited. These workshops are hosted by individual national networks and have covered themes including multiple sclerosis, bio-informatics and amyotrophic lateral sclerosis. Outside of the activities of the ICSCN, SSCN works bilaterally with individual networks to exchange information and share good practice and learning around its existing activities, such as public engagement and outreach within Scotland.

9.24 In the main, the national networks share similar core objectives, although there are some notable differences in relation to their governance and funding arrangements. For example, the North Rhine Westphalia Network in Germany is structured around two working groups, which determine its priorities and activities. The working groups include representatives from each research centre in the region involved in stem cells. In contrast, the Canadian network, the oldest stem cell network in the world, is managed by a Board, which also appoints the scientific director and approves the annual budget.

9.25 There have been notable changes in the structure of some of the ICSCN members. For instance, the Australian Stem Cell Centre (ASCC) funding ended in 2011 after nine years and the network is being replaced by Stem Cells Australia, which will retain some of its activities. The Canadian Stem Cell Network is in the 11th year of a 14 year funding cycle and already plans are in place for its organisational legacy. Realising the uncertainty of public funding, the Irish Stem Cell Foundation has opted for constitution as a charity, which will enable it to receive donations for its key activities in education and public outreach.

9.26 There are significant differences in relation to the emphasis the networks place on commercialisation. Consultations with members of the ICSCN reveal the SSCN and the Canadian network place the strongest emphasis on translation and commercialisation. SSCN is noted for its strong relationships with industry, including their involvement in the network. The Canadian network facilitates the translation of research into clinical trials through its well funded research programme, which requires that each project has a commercial partner from the outset. The network also supports commercialisation activity through an IP protection fund and a commercialisation boot-camp, which enables trainees to obtain assistance to develop a business plan. Other networks, including the German and Australian initiatives, are much more focussed on developing the basic science and bringing clinicians and researchers together.

9.27 Overall, the general perception is that SSCN is an important player globally, and is regarded as representing not just Scotland but also UK wide interests. *“SSCN has been a stable voice in the UK over the last 10 years...some of the other UK networks have disappeared and SSCN is seen as the principal point of contact in the UK.”*

9.28 International counterparts highlight SSCN's role in facilitating collaboration between academics and young companies in Scotland as well as bringing together all the interest groups (including researchers, clinicians, charities and patient groups) as key achievements. One consultee commented that *‘SSCN is doing everything to create a view that Scotland is a*

major player in the revolutionary field of stem cell... at a time when other networks are floundering, SSCN is progressing'.

Summary and Conclusions

9.29 The international mapping exercise reveals SSCN has a high level of visibility in the international stem cell community, and engages with other national networks on a number of fronts, including joint delivery of activities. There are clear differences in the governance arrangements for each network, and the emphasis that is placed on basic research versus commercialisation. It is obvious however that achievement of the latter is often reliant on the scale of funding available. The Canadian network is the exception rather than the rule, as its funding structure has enabled it to divert a substantial proportion of its core funding to commercialisation activities.

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 This chapter draws together the research findings and presents a number of recommendations on the way forward for the SSCN, Scottish Enterprise and partners. They are designed to address the evaluation objectives set out in chapter two at Box 2.1.

Strategic 'Fit'

10.2 The SSCN has been and remains well aligned with the Government Economic Strategy and successive Scottish Enterprise Business Plans as an important mechanism for supporting Stem Cell based regenerative medicines with commercial potential. The SSCN has had, and is demonstrating, an increasingly commercial focus, a transition which could and should continue further. Within the Life Sciences strategy, the SSCN is an important contributor, and in the main the SSCN is the umbrella public policy instrument for work in the Stem Cell field.

10.3 The SSCN is not the only networking initiative to support the sector, and there is some overlap between the SSCN and other initiatives, particularly Nexus. The mapping work carried out for this study, however, suggests that there is more complementarity between SSCN and other networks than there is duplication. Whilst some of the SSCN services could be delivered by others, the conclusion, endorsed by stakeholders, is that there is sufficient merit in having a network such as SSCN specifically focused on networks. The Scottish Life Sciences Alliance (SLA) is another important player in the sector, and whilst the SLA has a strong lobbying role on behalf of its business members, the SSCN has a much broader sectoral role that importantly brings academics and industry together which is valued as much by the former as the latter.

The Market Failure Rationale

10.4 The market failure rationale derived from the fragmentation of the sector and the lack of information available to companies and researchers on related activities in the sector. Back in 2003, it was difficult to pinpoint a Scottish stem cell community. Whilst research activities were taking place, there was little cross-institutional or cross-sectoral interaction. Eight years later, the landscape is very much different. One of the key achievements of the SSCN is that it has been able to address sectoral fragmentation, although this does not mean that all activities are co-ordinated or aligned, and there remains a strong rationale for a network, such as the SSCN, to continue to facilitate the exchange of information.

10.5 Sectoral fragmentation has been addressed by the SSCN having an overview of the key research, clinical, and commercial activities taking place in Scotland as well as the wider policy and regulatory context. There is no other organisation within the stem cell field within Scotland that has such an overview. Should the SSCN cease to exist post December 2012, there is a high risk the sector would lose the cohesiveness that the SSCN has worked hard to foster.

Activities and their Appropriateness

10.6 The role and activities of the SSCN have evolved and are focused on four key areas: providing networking opportunities, supporting the translation and commercialisation of stem cell research, promoting Scottish capabilities internationally, and education and skills development. The SSCN team is small and the scale and breadth of the activities are considerable. The team is well networked, having links and relationships with not only Scottish companies and research institutes, but international networks, companies and researchers.

10.7 It is largely SSCN's skills in brokerage and partnership working that allow the range of activities to be delivered, with many of its projects drawing on the expertise of its members, coordinating their inputs, and assuming a leadership role by taking responsibility for implementation. At this point, it is difficult to identify another organisation that would perform

such a function. Whilst individual members are happy to make a contribution, lack of time deters them to take the lead responsibility for any given project or activity. Given the breadth of activities, the SSCN must ensure it does not lose its focus on facilitating collaborative activity with commercial potential.

Supporting the Development of the Sector and Wider Outcomes

10.8 In having an overview of the stem cell sector, the SSCN has contributed to its long term development. The evidence shows, for example, that it has saved members both time and money by facilitating connections between them, or with external partners. This is one of the key benefits derived by members and one they value highly.

10.9 There are other ways in which the SSCN has contributed to the development of the stem cell sector. It has enhanced understanding between the research base and industry, thereby helping address one of the perennial barriers to commercialising scientific research. In addition to this, the SSCN has been highly effective in promoting Scotland's capabilities in the stem cell field internationally. It adds value to the work of the SDI and has played a key role in both outward and inward trade missions. Its success in promoting Scotland's capabilities can be seen most clearly in being invited to tender to host both the World Stem Cell Summit in 2014 and the ISSCR conference in 2015. There is little doubt that without the Network, these invitations would not have been made, and they reflect well on both the SSCN and Scotland.

10.10 SSCN's work in skills related projects is another way in which it is supporting the development of the sector, although as with many of its activities, the impacts of this will not be realised for some time. Nonetheless, the SSCN has played a valuable role in both canvassing the views of industry about skills gaps, designing projects to address these, writing bids for funding, and working with partners to deliver them.

10.11 SSCN's work in education and skills development highlights its two further strengths. First, it works hard to listen to its members – the introduction of the technology development fund is another example of this. More broadly though, the education projects reflect the maturing of the SSCN and the way in which its activities have evolved over time. It began as a research oriented network, but its focus has now shifted towards the translation and commercialisation of research. Moreover, SSCN seeks to engage in those activities that will support Scotland's economic priorities.

Economic Impact and Value for Money

10.12 The SSCN has received £1.76m from Scottish Enterprise since 2003 and raised a further £1.14 million from external sources. The additional funding has all been deployed on activities in Scotland. The SSCN constantly seeks to make the best use of public funding and offer maximum value for money by adapting materials and resources it has developed for one project and using them for another (e.g. see case study in Appendix 1) and working efficiently with other organisations to achieve its aims e.g. Scottish Enterprise and SDI.

10.13 The estimated net impacts are that the SSCN has, and is expected to generate at least £1.80m in direct net additional sales in businesses supported by the Network. This is a baseline estimate based on those identifying sales data, rather than the extrapolation of this data to all businesses supported by SSCN. The Network has and will secure a further £7.5m in wages GVA as a result of additional research income attracted to Scotland, which will support 40.1 net research jobs. Combined, the SSCN is estimated to have generated a net additional GVA economic impact ratio of £2.48 for every £1 of Scottish Enterprise investment.

10.14 Overall, it is clear that the SSCN is predominantly securing additional research which itself may in time generate further sales benefits for Scotland, rather than generating significant sales benefits at this time. This reflects the lack of maturity of the Stem Cell sector, and the need to continue the journey towards increased commercialisation of the research.

Future Funding and the Delivery Model

10.15 On the whole, the SSCN is highly regarded by members who value the services it provides, and believe it to be effective in the way it discharges its functions. There is, however, a reluctance on the part of members to contribute to the cost of the SSCN. The direct value derived by academic members is typically modest and the sector is facing resource constraints. Members from the private sector were more willing to consider the possibility of making a contribution, but argued that in doing so they would need to secure direct benefit in some way.

10.16 It appears unrealistic for the SSCN to wholly set itself up as an organisation able to deliver direct benefits to members. As the survey results show, few have experienced tangible or financial benefits from being a member of the SSCN. This is not uncommon for networks of this kind.

10.17 Different mechanisms for raising finance have been explored by the Network's Executive Team, which concluded that the SSCN cannot exist without a core level of public sector funding. From interview respondents too, there is a fairly strong call for Scottish Enterprise (or another public agency) to continue to provide core funding.

10.18 Whilst some form of core funding remains likely particularly in the short-term, any 'defeatist' attitude in relying on this funding should not prevail and seeking private sector and member finance wherever possible should remain an objective. Any means by which external finance can be raised should be pursued (and SSCN have clearly been proactive in seeking to secure additional European/public sector funding). The SSCN is not an expensive operation and even modest sums raised to recoup event costs through charging and sponsorship/other income can represent a reasonable proportion of operating costs.

Lessons and Learning Points

10.19 Chapters six and eight of the report has identified areas where SSCN could enhance its performance further. Without wishing to overplay the negative aspects of SSCN it is clear there are some areas where the SSCN could seek to strengthen its role and support. In terms of governance arrangements, the (strong) Advisory Group is not being used effectively or making use of its full potential. Respondents believe that the Advisory Group should assume a greater role in decision-making and the Advisory Group in turn should seek to influence LiSAB and Scottish ministers responsible for the Life Sciences.

10.20 The SSCN should seek to continue to extend its membership base, with a few citing its narrow or insufficient engagement. There has, arguably, been a historic dominance of academics, with the SSCN better at networking for them compared to facilitating links and introductions for companies operating in the sector. There is also a clear sense that there is an opportunity to broaden support out beyond biology to other sectors and disciplines, notably engineering or chemistry, which forms one of the report's recommendations.

10.21 Many interview respondents remained somewhat ambivalent about the additionality associated with the Network's activities, and, whilst this is inevitable to some extent given the breadth of the Network and the range of interventions (some of which are at a low level), the SSCN must remain aware that it should provide support that is not readily accessed elsewhere.

10.22 The economic impact analysis indicates that the SSCN is more effective in facilitating increased research income than generating sales. This is one of the key learning points from this study, which adds to the evidence gathered in other Life science related support programmes. Supporting the sector is a long haul, one there remains a considerable time lag prior to the realisation of benefits.

Summary Conclusion

10.23 At this point in time, Scotland is regarded as one of the leading destinations in the world for stem cell research and has a competitive advantage that few other countries yet have. However, there is little doubt that global competition is intensifying as each country seeks to secure both the economic and health benefits of stem cell research. In light of this and given the contribution of the SSCN to the development of the sector, it would be unwise for it to cease to exist in December 2012. Such a scenario would undermine the investment made by Scottish Enterprise to date, both in the SSCN and related infrastructure.

Future Direction and Recommendations

10.24 Against this context, the study makes the following recommendations:

1. The SSCN should continue to operate post December 2012, but to do so will require a core level of public funding. Funding models for a Network with such a large academic membership and relatively small commercial membership will always face difficulties in becoming self-financing, particularly with the level of ambition and activities that the SSCN undertakes.
2. That said, the SSCN should continue to find ways of supplementing public funding. Notably, it should adopt a more commercial approach with regards to charging for events. It should also explore opportunities for funding from philanthropic donations. Even modest levels of additional funding can represent a reasonable proportion of the (modest) SSCN operating costs.
3. In the context of the above, the SSCN should continue to seek to broaden its membership, particularly its business member base, to create a greater pool of potential contributors of private sector finance. It should seek to achieve this without any diminution of the strong standing the SSCN has with the academic base, a key strength of the Network (and a differentiator from other related networks).
4. As part of the route to achieving 3 above, the SSCN should actively seek to secure increased membership from related disciplines (commercial and academic), for example engineering and chemistry, and to promote knowledge transfer and collaborative activity cross-discipline.
5. At the strategic level, with a new Chair and following this review, there is an opportunity to refresh the SSCN strategy, and to develop a strong strategy that provides leadership for the Network.
6. Related to governance, consideration should be given to reconfiguring the Advisory Group, for example, in terms of a reduced size and with a greater role in decision making. Its membership could be reviewed every two years too, for example.
7. In the wider context of the SSCN constitution, a fresh look at the advantages and disadvantages of Charitable Status should be taken. This would allow some fundraising activities that are currently not an option for the Network. (This approach has been adopted by the Irish Stem Cell Sector).
8. This discussion should be held in light of the strategic direction of SSCN which should not lose sight of its key role in promoting practical moves towards the commercialisation of stem cell regenerative medicine.

APPENDIX 1: CASE STUDIES

Case Study 1: Project REALISE

The Issue

There are high hopes for the stem cell sector and/or regenerative medicine in being able to shift the boundaries of innovation and for companies to be able to prosper from new global market opportunities. However, key features of the sector have led to predictions that it will be difficult to realise potential value and those that try may fail in their attempts. The most notable of these features include:

- The nature of the industry – a high level of development stage companies, including those in preclinical or clinical trial stages;
- The nature of the products and the options to commercialise – e.g. cell-based products with short shelf lives that cannot be manufactured;
- The influence of systemic interactions including regulatory systems, finance providers and a wide range of other stakeholders.

In essence, established business models and the specification of the activities required to proceed along the value chain at three core stages, from Discovery through to Development and Delivery to the market, have not yet emerged for the stem cell and regenerative medicine sector.

In direct response to this, the SSCN formed the project REALISE consortium to develop a Therapy Realisation Pathway Tool.

The Solution

The Therapy Realisation Pathway Tool (TPRT) is an interactive software application that will lead and guide those developing products in regenerative medicine through a matrix model covering the three phases from bench to bedside (Discovery, Development and Delivery) and five procedural streams, which are:

- i. Science and Technology;
- ii. Manufacture and Scale Up;
- iii. Regulation and Governance;
- iv. Business Models; and
- v. Funding and Investment.

Within the framework of phases and streams, the Pathway is populated by (several hundred) actions. The actions are intended to be followed in a logical sequence of steps so that there is a co-ordinated approach across the streams, highlighting any critical stages at which decisions need to be made as to how to progress towards a therapeutic product. All actions are driven by the aim to deliver commercially viable products to the clinic, directing users to focus on the following:

- **Steps to Market** – identification of the actions required to bring the product to market from discovery through development to delivery of therapies.
- **Value Chain Analysis** and value assessment – providing an analysis of the value chain for a given product, thereby enabling users to develop an understanding of the likely value systems that influence the value chain;
- **Economic and Business Plan Models** to attract funding and enable commercialisation – The tool will suggest business models that will allow the product to be commercialised. Users will be able to draw on this analysis to underpin proposals to commercial partners and/or for investment funding.

One of the key strengths of the tool is that it can be used iteratively and predicatively to model the best option for a particular technology within the wider value system which it is seeking to penetrate. It will guide companies through the challenges facing the development of their specific regenerative medicine product, informing them of the business models to adopt.

The Consortium

With SSCN leading the bid and managing the project, other consortium members include: Roslin Cells, Innogen (the University of Edinburgh) and KLCE consulting. To develop the commercialisation routes, the consortium has worked with and drawn upon the insights of an industry led Expert User Group. The infrastructure underpinning the tool has been led by SSCN's sub-contractor New Game-Plan Ltd.

Piloting the Tool

The Therapy Realisation Pathway Tool is being tested on three products that are moving towards commercialisation, but firm plans as to how this should occur are at an early stage. These are

- Clinical grade Pluripotent Stem Cells;
- Artificial Liver device; and
- Red blood cells from hESC.

Project Outputs

Once completed, the project will generate five outputs: the Therapy Realisation Pathway Tool; Product Development and Commercialisation Plans for each of the three products being tested by the tool; value system analyses for each of these potential products, and an economic modelling tool (see below). In addition, it is expected that the tool will be of benefit to policy-makers and regulators by developing policy recommendations based on a framework validated by real products and an assessment of the sector as a whole.

Market Opportunities and Wider Outcomes

The tool will enable the three products being piloted to realise market opportunities. It also has the potential to deliver two further outcomes. The first will emerge when the tool is made available to the wider regenerative medicine community and support their specific commercialisation strategies. It will prove valuable in developing business plans for a diverse range of products, where it is unlikely that a single modelling paradigm will work. For example, when deciding on a basic research strategy to support a future commercial product, it may be appropriate to examine downstream scalability and manufacturing if large amounts of material are required. Conversely, the delivery of therapeutic products will be optimised if the early research phase focuses on variables such as product stability and reproducibility.

Second, the tool will facilitate a robust economic impact analysis of a regenerative medicine project and, in so doing, replace the existing approach used by development agencies and governments.

The economic impact of investments is based on a number of assumptions. Up to now, policymakers have tended to draw on the assumptions underpinning investments in drug discovery or medical technology when assessing the economic impact of investment in regenerative medicine. However, these assumptions are not as robust when applied to novel business models in the emerging regenerative medicine sector. The Therapy Realisation Pathway Tool can overcome such limitations because of the data that will be input when users are developing commercialisation strategies for a particular product. In essence, a more robust estimate of the economic impact will emerge because of the input of sector specific data, which in turn, will generate further benefits relating to economic development.

In the short term, the tool will generate new and more robust multiplier data relevant to the regenerative medicine sector. In the medium term, the tool will allow better understanding of

the adjustment factors (e.g. counterfactual, additionality, displacement etc) relating to specific business models operating in regenerative medicine. In the long term, it will be possible to interrogate the tool for economic data and illustrate the impacts of given investments on the wider economy.

Case Study 2: Education and Skills Development

Training and education activities have become increasingly important within the SSCN's portfolio of work. They help to promote better interaction between scientists and the public, which is a key objective of the Science Engagement Grant (SEG) programme run by the Office of the Chief Scientific Adviser. A number of the projects focus on meeting the objectives of the science and moral streams of Scotland's Curriculum for Excellence (CfE). They also seek to inspire a new generation of scientists and, in this way are geared towards addressing the skill gaps within the stem cell sector. In short, SSCN's education activities contribute to several national policy objectives. As detailed below, the Network's projects span a wide spectrum of educational levels, ranging from work in secondary schools through to the development of a new post-graduate MSC degree course and CPD training for those already in work.

Stem Cell Road-Show

In June 2009, SSCN secured a Science Engagement Grant to deliver a pilot project – the *Stem Cell Road-Show* – to three schools during May and June 2010. The road-show had two objectives. First, to contribute to the CfE's goal of "*encourage[ing] meaningful debate so that pupils grow up into adults who can make an informed choice*". Second, to address the Network's own public engagement objective, particularly with regards to overcoming bias and misinformation amongst high school students about stem cells and their use in medicine.

On receipt of the SEG, SSCN used some of the funding (£8000) to consult with teachers and pupils to find out what resources would be most useful in providing a rich learning experience. The consultation revealed that the following would be most valuable:

- Validated and accurate science facts about stem cells on what they can and cannot do.
- Access to experts to answer pupils and teachers questions about stem cells;
- Interactive activities to engage pupils in learning and understanding;
- Topics to debate from the moral and ethical perspective as well as factual information.

Drawing on its members, SSCN produced a set of resources for the schools prior to the road-show to enable them to prepare for it in advance. This included an exhibition of posters produced by the Biotechnology and Biological Sciences Research Council and the Medical Research Council summarising the 'hype' and 'hope' behind stem cells, as well as materials for teachers. The road-show itself comprised several elements. A presentation of the key scientific and ethical issues surrounding stem cells was delivered by a researcher active in the field. This was followed by discussion activities around the ways in which stem cell stories are presented in the media, along with a selection of hypothetical dilemmas for pupils to assess. A key aim of the road-show was to present the facts around stem cells in a concise and accurate way, introducing the ways in which research is undertaken and the type of work carried out by scientists in this area. The road-show enabled some challenging ethical issues to be debated, with informed input from scientists. In turn, this supported pupils' learning about the potential of stem cell research, enabling them to form more accurate and evidence-based views.

As well as helping meet key learning outcomes of the CfE, the road-show also contributed to teachers' own development and learning. The level of specialist support provided by leading scientists increased the knowledge base and confidence of teachers, particularly given that many of them reported that they find it difficult to keep abreast of new developments in cutting edge areas such as stem cells and regenerative medicine.

Talking Stem Cells

Both academic and business members of the SSCN have expressed concern about the future development of the stem cell sector in Scotland because of a shortage of suitably trained people. The shortage arises from the lack of accurate and engaging resources supporting the teaching of stem cells which means few young people choose to study relevant subjects. In light of this, in March 2011, the SSCN secured further funding from the SEG to deliver a follow on project to the *Stem Cell Road-Show*. With the primary target group continuing to be pupils aged between 11-15, this project has two core objectives. First, to highlight the career opportunities available in science, thereby encouraging more young people to choose to study subjects relevant to regenerative medicine. Second, as with the road-show project, to enhance young people's understanding and knowledge about stem cells, thereby providing a solid foundation upon which they can engage in ethical debates and make scientifically informed decisions.

An evaluation of the pilot road-show found that one of its most valuable features was the opportunity for students to engage directly with the researchers. However, the delivery model used for the pilot is not viable for wide-scale roll-out because of the number of scientist days it would require to visit even, for instance, 20% of Scotland's secondary schools. With this in mind, SSCN proposed a new delivery model, one that is not only efficient, but is also interactive, makes use of social media and, thereby, appeals and engages the young people.

The *Talking Stem Cells* project includes a resources portfolio developed by members, which is available in a diverse range of media formats from printed workbooks and information sheets, through to interactive quizzes, learning exploration and video and web based activities. These resources are being used by the scientists when delivering a series of *Talking Stem Cell Workshops* via Glow Meet. This enables the scientists to engage with pupils from participating schools over a video link and reach a much larger number from their laboratories than visiting one school. This approach also overcomes geographic barriers, allowing pupils from Scotland's rural areas to benefit from the project too. The resources portfolio also includes a specially created pack for teachers to help them both prepare in advance for the workshop as well as follow up with activities afterwards.

Another way in which the *Talking Stem Cell* project differs from the pilot is that there are more opportunities for students to undertake practical activities themselves. This responds to feedback obtained during the evaluation of the pilot project where pupils and teachers reported they would benefit from more practical involvement.

For schools unable to take part in scheduled Glow Meet workshops, teachers are able to use a 'light' version of the resources portfolio with online support from scientists.

The project began in April 2011 and will run to December 2012 to fit with the academic year and the availability of schools to participate. Over that time, it is expected that the project will deliver 24 Glow Meets, reaching over 1200 students and a further 1200 reached through the individual teacher led 'light' version of the workshops.

Talking Stem Cells led to a spin-off project being delivered in Midlothian. Schools in the area needed to deliver more cross-curricular activities and the SSCN suggested that this could be addressed through a series of workshops focusing on stem cells as this would encompass both biology and ethics. Some of the workshops have already taken place and the SSCN has received very positive feedback from teachers. The spin-off project exemplifies one of the key features of the SSCN – it constantly seeks to maximise resources and materials it has developed for one project by building or adapting them for another. In this way, its activities can be seen to make best use of public funding, offering maximum value for money.

ESF Strategic Skills Pipeline Project

Road-mapping workshops undertaken for project realise showed there is a gap in the availability of existing skills within the stem cell sector. Niche skills in areas such as manufacturing, regulatory compliance technical support and clinical delivery and needed to support the growing stem cell sector. At the same time, there is an acknowledgement amongst policymakers that few of the existing jobs and employment opportunities available within the sector are taken-up by the local residents in those areas where companies and the research institutions are based.

Against this context, the SSCN approached Midlothian Council to apply for an ESF grant in order to address local employability issues as well as long term sectoral skills gaps. The application for funding was successful and the project, which began in April 2011, is expected to continue to March 2013.

By drawing on the expertise of its members, SSCN has detailed more clearly existing capability gaps within Scotland's regenerative medicine industry. This analysis is informing the development of new accredited training programmes, which is being undertaken by the University of Edinburgh and some of them will be delivered at the new Centre for Regenerative Medicine. Essentially, ESF funding is being used for the following:

- The development and delivery of road-shows in schools, targeting young people at Higher /Advanced Higher level in the science and engineering subjects. The road-shows, a number of which have already taken place, are highlighting the career opportunities available across regenerative medicine. In so doing, they make clear that opportunities are not confined to those with high-level degrees in science, but include jobs in areas as diverse as law and quality assurance. The SSCN put together a brochure which included profiles of individuals working in the stem cell sector, highlighting their roles and the different routes through which they found employment.
- Promoting re-training opportunities to professionals in related high-tech industries and/or those operating in declining sectors who may be interested in transferring to the regenerative medicine sector.
- Providing CPD training to key healthcare professionals to enable them to acquire the skills to work in the emerging regenerative medicine field.

As with some of the other SSCN projects, this project is generating various spin-off activities and, in the process, maximising the resources that have been developed. The careers brochure, which was originally developed to supplement the road-show workshops, will be made available more widely. In addition, SSCN is currently in discussions with the Midlothian Education Authority about the possibility of stem cell sector companies and researchers having a presence at careers forums as part of *world of work day*

Developing an MSC for Regenerative Medicine

Companies in the stem cell sector report that they find it difficult to recruit graduates who are ready to work as bench scientists on the one hand, and scientists who are commercially aware on the other. In response to this, the SSCN worked with the University of Edinburgh to develop an MSC for Regenerative Medicine that focused on industry and business development as opposed to the science of stem cells. Drawing on some of its existing units, the University is currently developing such a degree, as reflected in its name: *MSc for Regenerative Medicine for the Pharmaceutical Industry*. Two further features highlight its commercial/industry focus. First, companies from the sector will be invited to give presentations on various topics and this will be facilitated by the SSCN. Second, students will be required to undertake a three-month industry placement at a company in Scotland and, again, this will be facilitated by the Network. The degree will become available in October

2012 and will be targeted at fast-track scientists working in industry, as well as academics who may wish to start a spin-out company.

Case Study 3: International Trade and Inward Investment

Background

Scotland is one of Europe's largest and most highly regarded stem cell and translational medicine locations. It is home to an active cluster of leading academic institutions and research centres such as the Scottish Centre for Regenerative Medicine as well as high growth cell based technology and manufacturing companies including Roslin Cells, Cellartis and Angel Biotechnology.

By supporting stem cell companies and both embryonic and adult stem cell academic research, Scotland offers a vibrant commercial supply chain working alongside global science companies such as EMD Millipore, Charles River Laboratories and Life Technologies.

The Edinburgh BioQuarter underpins Scotland's life sciences and regenerative medicine community. This 100 acre public and private site brings together three leading research institutes, a teaching hospital and a biocubator. The BioQuarter hosts the Centre for Regenerative Medicine, which is particularly attractive to stem cell companies.

SSCN works in partnership with the Scottish Development International (SDI) to raise awareness of Scotland's stem cell cluster and promote its key strengths. Both organisations attend major international conferences, for example, the World Stem Cell Summit, which attracts leading researchers, scientists and companies from around the world. By attending these events, SSCN and SDI are able to promote Scottish capabilities, infrastructure and heritage in stem cell to large biotechnology companies and new SMEs who may become inward investors.

Attracting Clinical Trials

Promoting Scotland as an ideal location for clinical trials due to its excellent patient data and registration resource is important in encouraging the translation of stem cell research. SSCN accomplishes this objective in a number of ways, including through symposiums and events. As part of its development of a roadmap to clinical delivery, the Network has hosted a series of events '*Pathways to Stem Cell Therapy*' which identify progress to therapy in degenerative diseases. These workshops identify key drivers and obstacles; and opportunities to drive the field forward. The *Pathways to Stem Cell Therapy* workshops attract experts in each field including academic researchers and international companies. For instance, Viacyte, a US based company was invited by SSCN to attend the '*Pathways to Stem Cell Therapy*' Diabetes workshop because of its development of stem cell therapy for Type 1 diabetes. Representatives from the company attended the workshop and provided an overview of their current therapy development.

During their visit, SSCN arranged several meetings with Scotland based stem cell companies, regulatory consultants and academics. Representatives from the company also visited a tissue bank at one of Scotland's hospitals. These visits provided Viacyte with first hand experience of Scotland's capabilities in stem cells. SSCN also brokered an introduction between the company and SDI, which led to the latter visiting its operations in California. SDI shared the benefits of Scotland and highlighted the opportunities available to establish an operation or conduct clinical trials.

The company is currently awaiting EU approval for its cell lines, however it has reported that as a result of the support received from SSCN and SDI, **Scotland is one of two countries being considered as host of clinical trials for Type 1 diabetes.**

Case Study 4: Avanticell

AvantiCell Science Ltd is a biotechnology company specialising in cell-based analysis for use in drug discovery and development in a range of R&D situations. Assays incorporate physiologically-relevant cell types, which tend to be primary cells of human origin, but increasingly are based upon human stem cells.

Founded by Drs Colin Wilde and Jo Oliver, the company was incorporated in June 2006 to exploit know-how and proprietary technology for the culture of mammalian cells. It operates from premises on the Auchincruive campus of the Scottish Agricultural College outside Ayr, where it occupies laboratory facilities customised for the isolation and handling of human cells, and their incorporation into robust cell-based analytical systems.

Since its incorporation, AvantiCell has sought to position itself as a leading-edge provider of cell culture technology. Its development has primarily been financed by sales revenue and some modest external investment by Barwell PLC and the Scottish Enterprise Co-investment Fund.

Strategic Partnership

AvantiCell's founding principle is that advances in cell culture technology enable the development of physiologically-relevant alternatives to animal testing in research and drug discovery. Accordingly, the company has established strategic partnerships that give access to the right starting material – the physiologically-relevant cells. These partnerships have been catalysed by support available from Scottish Enterprise and are maintained by a network of national and international collaborations supported through UK government and EU Framework 7 programmes.

One of the company's co-founder's believes that its network of business and scientific contacts were a key asset when the company was first started. Over time, these o have developed into "powerful partnerships" enabling AvantiCell to not only deliver its own technology in optimal form, but also have a greater commercial footprint by drawing in partner technology. In essence, Avanticell can deliver comprehensive solutions tailored to its customers' needs.

AvantiCell's cell-based analysis offers a value proposition based upon the quality and physiological relevance of the constituent cells. This has allowed it to form partnerships with leading Scottish companies operating in the preclinical stem cell space, and to wider connections with consortia involved in regenerative

Diversification

Cell-based analysis based upon physiologically-relevant cells has applications beyond the field of drug discovery, and AvantiCell is progressively adapting its assay platforms for application in the evaluation of natural products, including traditional medicines, and for nanosafety testing. It has also developed a high-content assay using cell-proteomic profiling that can deliver the detailed analysis of stem cell populations required to detect subtle changes in cellular function. The company has formed new strategic partnerships to realise the potential of this assay t. Overall, AvantiCell has ambitious plans to take its technologies into international markets. Due to its focus on natural products and traditional medicines, AvantiCell has forged growing links with the North American and south-east Asian life science markets.

Case Study 5: Sisticmic

Sisticmic Ltd is an award winning, ambitious company which aims to be a global leader in the development of novel microRNA-based problem-solving products for the drug development, cell therapy and bioprocessing markets.

Sisticmic Ltd. has developed a unique analytical tool to enhance miRNA profiling, turning it into a more versatile problem solving technology, which it is using to address areas of unmet need within the biotechnology/pharmaceutical markets & the Cell Therapeutics communities.

Sisticmic started trading in 2009, establishing its headquarters in Glasgow, and has since expanded to establish facilities in Boston, Massachusetts. This reflects Sisticmic's ambition to operate globally and the company is now serving markets across the UK, Europe and North America. In fact 70% of its current client base comes from international territories.

The company's products include SistemRNA™ which is its core enabling platform from which it delivers to main service areas:

- The Drug Discovery & Development markets such as SistemTOX™ (toxicity profiling) and SistemKB (knowledgebase profiling); and
- The Cell, Stem Cell and Cell Therapies markets SistemQC™ (cell characterisation & QC).

Example applications include screening of drug discovery lead compounds to determine whole cell response to various chemistries as well as cell characterisation, QC monitoring, purity, potency and pluripotency assessment of cell and stem cell lines.

Sisticmic devotes the majority of its commercial efforts to talking to its clients and prospective new customers (globally) to find out what that they need help with. It seeks to work with them to deliver products that will help expedite their research and, in the longer term, help them bring safe and efficacious therapies to the clinic.


























Sisticmic's miRNA profiling has been very successful, as reflected in sustained interest from the drug discovery and cell therapeutics markets. As a result, the company was able to announce in June 2011 that it will expand its existing operations, leading to an increase in a number of scientific and bioinformatic staff and a move to a larger dedicated facility near Glasgow, which will become the company's new global headquarters. The expansion programme will enable Sisticmic to fulfil its current contracts more rapidly and, also, provide further capacity for future contracts. It will also support the company's expansion of its key internal R&D programmes in drug toxicology and stem cell characterisation. The expansion programme will also help the company grow its US commercial operations, which will include the development of its Boston location and a new office to be opened in California.

The Support of SDI and the SSCN




Both SDI and the SSCN have supported Sisticmic with its internationalisation ambitions. SDI has been able to provide advice on the local markets and how business is done in those regions. SDI and SSCN have prove to be extremely valuable in helping the company gain access to key market information as well as aiding the development of its networks in its primary target markets.

APPENDIX 2: SCOTTISH STEM CELL SUPPLY CHAIN

The table below lists the companies operating within the stem cell sector in Scotland.

Scotland's Stem Cell and Regenerative Medicine Commercial Landscape	
Supply of cell lines	Roslin Cells 
	Cellartis 
	Pharmacells 
Therapeutics	Antoxis 
	Geron 
	Fibromed 
Screening Tools	CXR Biosciences 
	Cellartis 
Scale –up and Manufacturing, Logistics	Ingenza 
	Aptuit 
	Angel Biotechnology 
	Cellartis 
Supporting Technologies, Reagents	Life Technologies 
	ImmunoSolv 
	Deliverics 
	Avanticell 
	R Biomedical 
	Sistemic 
	Millipore 
	Antoxis 
Quality Assurance and Control	Bio Outsource 
	Vitrology 
	Bio Reliance 
	Charles River 
	Sistemic 

Scotland's Stem Cell and Regenerative Medicine Commercial Landscape

	Vyvo Bio Solutions 
Infrastructure and Research Support	Roslin Cellab 
	Scottish Biomedical 

APPENDIX 3: LIST OF CONSULTEES

Organisation Type
Academics
University of Aberdeen
University of Edinburgh (x 5)
University of Edinburgh
Companies
FibromEd
Angel Biotechnologies
AvantiCell
Devro Medical
Formerly at Cellartis
Glycomar
Immunosolv
Life Technologies
Perkin Elmer
Pharmacells
Roslin Cells
Sistemic
Viacyte Inc
Policy and Public Outreach
Innogen
Genetics Policy Institute
Canadian Stem Cell Network
Rhine Westphalia Stem Cell Network
UKNSCN
UKSCF
Education project manager
Economic Development
Scottish Enterprise (x3)
SDI
ESEP
Nexus
Education and Training
Scottish Funding Council
University of Edinburgh
Midlothian Council
Dundee Science Centre

Glasgow Science Centre
Skills Development Scotland
Executive Team and Other
SSCN (x3)
Past SSCN Chair
Scottish National Blood Transfusion Service
DLA Piper
Consultants
Borders Technology Management
KCLE Consulting
Argentix
Ilyine Ltd, SSCN Advisory group
Charities
British Heart Foundation Scotland
MS Scotland

APPENDIX 4: ONLINE MEMBER SURVEY

Evaluation of the Scottish Stem Cell Network

This consultation forms part of a review of the Scottish Stem Cell Network (SSCN), which GEN Consulting is conducting on behalf of Scottish Enterprise. The review is assessing the impact of the Network's role on the development of the stem cell sector in Scotland and its wider impact on the economy.

This survey asks about your involvement with the Network, your views on how well it has fulfilled its role, and the different ways in which you may have benefited from its activities.

To begin the survey click on the link below. It will take between 15 to 20 minutes to complete. All responses will be treated as confidential and only used in aggregated form so that no individuals can be identified.

https://www.surveymonkey.com/s/SSCN_Membership_Survey

Should you have any queries about the survey, please contact Dr. Marilyn Robertson at the SSCN at the following email: Marilyn@sscn.co.uk

Section 1: Profile and Membership

1. When did you become a member of the SSCN? *Please tick one*

2003		2009	
2004		2010	
2005		2011	
2006		Don't know	
2007		Not a member	
2008			

2. Which of the following best describes the organisation you work for? *Please tick one*

Academic	1	Route to 3	
Small or Medium sized business employing less than 250 people	2		
Large business employing 250 and more people	3		
An independent commercial laboratory	4		
A private sector research institute	5		Route to 4
A public sector research institute	6		
NHS/hospital	7		
Government	8		
Not for profit organisation	9		Route to 2b
Other [please specify]	10	Route to 4	

2.b: Which of the following best describes the area in which your organisation operates?

Health	Route to 4
Medical research	
Education	
Patient advocacy	
Legal Affairs	
Consultant	
Supply Chain	
Regulatory	
Tools and Technologies	
Patent Affairs	

Other [please specify]	
------------------------	--

3. Which of the following best describes your current position?

Chief Executive		Go to 4
Head of Operations		
Head of Research and Development		
Director (e.g. of finance)		
Head of department (e.g. at university)		
Professor or equivalent		
Reader or equivalent		
Senior lecturer / researcher or equivalent		
Lecturer / researcher or equivalent		
Post-doctoral researcher		
PhD student		
Undergraduate / Masters student		
Other [please specify]		

4. Which country are you mainly based in?

Scotland		Brazil	
Other part of the UK		Russia	
Other EU		India	
US		China	
Canada		Japan	
Australia		Other [please specify]	

Section 2: Activities and Role

5. Which of the following have you done? *Please give a response for each row*

	Yes	No
Accessed the SSCN website		
Received travel award		
Made connections via SSCN		
Attended <i>Progress to Therapy</i> workshop		
Attended <i>Basic Biology</i> Forum		
Attended other training workshops / events		

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Read quarterly newsletter		
Benefited from bespoke SSCN assistance [please specify]		
Other [please specify]		

6. On a score of 1 to 5 where 1 is not very effective and 5 is very effective, how effective is the SSCN in....?

	1	2	3	4	5	DK
	Not very			Very		
Providing a good opportunity to network with others involved in the stem cell field						
Promoting collaboration between different parties active within the stem cell sector						
Promoting greater understanding between academia and industry						
Coordinating the activities undertaken by various types of organisations within the Scottish stem cell sector						
Facilitating interaction between the Scottish cell community and overseas companies and researchers						
Encouraging and assisting with the commercialisation of research within the Scottish stem cell sector						
Providing bespoke assistance to SMEs to address particular needs						
Promoting public understanding of developments within stem cell sector						
Promoting Scotland's profile on the international stage as a centre of excellence within the stem cell field						
Acting as the national voice of the Scottish stem cell community to policymakers and regulators						

7. Please indicate the degree to which you agree or disagree with the following statements by ticking one box for each statement.

	Agree strongly	Agree	Neither	Disagree	Disagree strongly	D/K
I feel that I am part of the SSCN						
The SSCN has helped create a stem cell community in Scotland which did not exist previously						
The SSCN provides valuable events and resources						
The SSCN represents the Scottish stem cell sector to overseas researchers in a positive way						
The SSCN helps progress research and product processes towards a more commercial outcome						

The SSCN is NOT relevant to me						
--------------------------------	--	--	--	--	--	--

8. Have you undertaken any of the following activities on behalf of the SSCN?

	Yes	No
Given a presentation at an event organised by the SSCN		
Developed materials for public outreach activities		
Delivered public outreach activities (e.g. Stem Cell Roadshow, Talking Stem Cell Workshops)		
Contributed to bids to access funding for Network activities		
Used your expertise in any other way on behalf of the Network [please specify]		

9. If the SSCN did not exist, would you have undertaken the aforementioned activities?

	Yes – Definitely	Yes – Probably	Probably Not	Definitely Not	Don't know	N/A
Given a presentation at an Stem Cell related event						
Developed materials for public outreach activities						
Delivered public outreach activities						

Section 3: Changes in Attitudes

THIS SECTION TO BE ROUTED TO THOSE CODES AS 1, 5–10 IN QUESTION 2.

10. To what extent do you agree or disagree with the following statements regarding your perceptions and attitudes towards industry. As a result of my involvement with the SSCN...

	Agree strongly	Agree	Neither	Disagree	Disagree strongly	D/K
I have increased my understanding of the commercial environment						
I have increased my awareness about the career opportunities available in industry						
I have a better understanding of what investors are looking for						
I am more likely to think about the commercial opportunities associated with my work/research						
I am more inspired to pursue a career in industry						
I feel more confident talking to industry						

I have improved my perception and attitude towards industry						
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THIS SECTION TO BE ROUTED TO THOSE CODES AS 2–4, 10 IN QUESTION 2.

11. To what extent do you agree or disagree with the following statements regarding your perceptions and attitudes about the research base. As a result of my involvement with the SSCN...

	Agree strongly	Agree	Neither	Disagree	Disagree strongly	D/K
I have increased knowledge about the type of research taking place						
I have increased knowledge and understanding about how to access knowledge and technology from the research base						
I have increased my awareness about the commercial opportunities associated with the research						
I have a better understanding of what investors are looking for						
I am more inspired to pursue a career in research						
I feel more confident talking to the research base						
I have improved my perception and attitude towards the research base						

Section 4: Benefits

Networking and Collaboration Benefits

12. On a score of 1 to 5, where 1 is not at all and 5 is to a great extent, to what extent have you experienced any of the outcomes listed below as a result of your involvement with the SSCN?

	1	2	3	4	5	N/A	DK
Strengthened relationship(s) with existing academic contacts							
Established new relationships with academics that you may not otherwise have been able to do so							
Strengthened relationship with existing business contacts							
Established new relationships with businesses that you may not otherwise have been able to do so							
Established new relationships with other parties active in the stem cell field that you may not otherwise have been able to do so							

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	1	2	3	4	5	N/A	DK
Increased your organisation's profile or awareness amongst UK and/or overseas academics							
Increased your organisation's profile or awareness amongst/ UK and/or overseas businesses							

13. Have you engaged in any collaborative work that resulted from contacts made/strengthened through the SSCN?

Yes – a project / joint venture is underway		Route to 14
Yes – a project / joint venture is being discussed		Route to 14
No		Route to 16

14. And what is the financial value of this project / joint venture?

	Value of project	
	Underway	In discussion
No financial value	Route to 15	Route to 15
Up to £250,000		
£250,000–£499,999		
£500,000–£749,999		
£750,000–£999,999		
£1m		
Over £1m [please specify]		
D/k		

15. What are the qualitative (i.e. non-financial) benefits associated with the project?

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16. If the SSCN did not exist, would you have been able to undertake/discuss the aforementioned project / joint venture?

	Underway	In discussion
Yes – Definitely		
Yes – Probably		
Probably Not		
Definitely Not		
Don't know		
N/A		

Information and Knowledge Transfer Benefits

17. From the SSCN, have you accessed information or knowledge about...?

	Yes	No
Policy, legal, regulation developments		

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Scientific and technological developments within the stem cell field		
Public sector funding and grant opportunities		
Markets and opportunities for stem cell research / therapies / products		
Commercial funding and investment opportunities		
Legal issues relating to the commercialisation process		
Regulatory issues relating to the commercialisation process		
IP issues relating to the commercialisation process		
Other aspects of the commercialisation process		
Other [please specify]		

18. And on a score of 1 to 5 where 1 is not valuable and 5 is very valuable, how valuable did you find the information or knowledge you gained from the SSCN about...?

	1	2	3	4	5	N/A
Policy, legal, regulation developments						
Scientific and technological developments within the stem cell field						
Public sector funding and grant opportunities						
Markets and opportunities for stem cell research / therapies / products						
Commercial funding and investment opportunities						
Legal issues relating to the commercialisation process						
Regulatory issues relating to the commercialisation process						
IP issues relating to the commercialisation process						
Other aspects of the commercialisation process						
Other [please specify]						

19. If the Network had not been established, how would this have affected the information or knowledge you have gained from the SSCN?

	Would not have been able to access this at all	Would have <u>taken me longer to access the information</u>	Would have accessed info <u>but in not as much depth, detail or quality</u>	Would have accessed info over same timer period and to same quality	N/A
Policy, legal, regulation developments					
Scientific and technological developments within the stem cell field					
Public sector funding and grant opportunities					

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Markets and opportunities					
Commercial funding and investment opportunities					
Commercialisation process					
Other [please specify]					

20. If the SSCN did not exist, how likely is that you would have had to pay for this information from a different source?

	Would have had to pay...				Not available elsewhere	D/K
	Definitely	Probably	Probably not	Definitely not		
Policy, legal, regulation developments						
Scientific and technological developments within the stem cell field						
Public sector funding and grant opportunities						
Markets and opportunities						
Commercial funding and investment opportunities						
Commercialisation process						
Other [please specify]						

21. And how much would this have cost – please provide an estimate even if this only indicative.

	Cost estimate	Don't know
Policy, legal, regulation developments		
Scientific and technological developments within the stem cell field		
Public sector funding and grant opportunities		
Markets and opportunities for stem cell research / therapies / products		
Commercial funding and investment opportunities		
Commercial funding and investment opportunities		
Legal issues relating to the commercialisation process		
Regulatory issues relating to the commercialisation process		
Other [please specify]		

22. To what extent do you agree or disagree with the following statements..?

	Agree	Agree	Neither	Disagree	Disagree	D/K
--	-------	-------	---------	----------	----------	-----

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	strongly				strongly	
The SSCN is my first port of call to access information about stem cell activities in Scotland						
The SSCN is my first port of call to access information about the commercialisation process						
The SSCN is my first port of call to access information about stem cell activities internationally						

Financial Benefits

23. Has your engagement with the SSCN enabled you access any research funding or other public sector funding?

	Research	Other public sector
Yes – funding has been secured	Route to 24	Route to 24
An application has been submitted to access funding	Route to 24	Route to 24
No – application has been submitted but rejected	Route to 24	Route to 24
No – have not tried	Route to 26	Route to 26
D/K	Route to 26	Route to 26

24. And what is the value of the funding you have accessed or are trying to access?

	Research	Other public sector
Up to £250,000		
£250,000–£499,999		
£500,000–£749,999		
£750,000–£999,999		
£1m		
Over £1m [please specify]		
D/k		

25. If the Network had not been established, to what extent would you have been able to access this funding?

	Research	Other public sector
Definitely would have accessed the funding		

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Probably would have accessed the funding		
Probably would NOT have been able to access the funding		
Definitely would NOT have been able to access the funding		

26. Has your engagement with the SSCN enabled you access funding from any of the following commercial source? *Please tick that apply*

	Yes – funding has been awarded	We are in the process of trying to secure funding
Bank loan	Route to 27	Route to 27
Bank overdraft		
Venture capital finance		
Business angel finance		
Other please specify		
We have not sought commercial funding		Route to 29

27. And what is the value of the funding you have accessed or are trying to secure?

Up to £250,000	
£250,000–£499,999	
£500,000–£749,999	
£750,000–£999,999	
£1m	
Over £1m [please specify]	
D/k	

28. If the Network had not been established, to what extent would you have been able to access this funding?

Definitely would have accessed the funding	
Probably would have accessed the funding	
Probably would NOT have been able to access the funding	
Definitely would NOT have been able to access the funding	

Commercialisation Benefits

29. Which of the following outcomes have you experienced as a result of your involvement with the SSCN?

	Yes	No	N/A
Developed a new process or technology			
Intellectual property agreement			
Patents (filed and pending)			
Patents achieved			
License achieved			
Spin out company formed			
Start-up business created			

30. Have you, or are you expecting to, generate any sales/turnover revenue as a result of your involvement with the SSCN?

Yes – achieved	Route to 30b
Yes – achieved <i>and</i> expect to continue doing so in future	
Yes – expect to do so in future	Route to 30b
No	Route to 32
Don't know	Route to 32

30b: If so, please specify the value of this. (*If you have secured turnover and expect to continue doing so in future, please tick the appropriate values in both columns*).

	Achieved	Expected
Up to £250,000		
£250,000–£499,999		
£500,000–£749,999		
£750,000–£999,999		
£1m		
Over £1m [please specify]		
D/k		

31. (a) When did you start to generate sales/turnover revenue and (b) how long do you expect to continue generating sales/turnover revenue as a result of your involvement with the SSCN?

31a: Started generating sales in....		31b. Expect to continue generating sales until....	
2005		2012	
2006		2013	
2007		2014	

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2008		2015	
2009		2016	
2010		2017	
2011		2018 and beyond	
Don't know		Don't know	

32. Have you, or are you expecting to, access new markets or customers of your involvement with the SSCN?

Yes – accessed new markets or customers	Route to 32b
Yes – accessed new markets or customers <i>and</i> expect to continue doing so in future	Route to 32b
Yes – expect to do so in future	Route to 32b
No	Route to 34
Don't know	Route to 34

32b: If so, please specify the financial value of your access to new markets or customers. (*If you have accessed new markets or customers and expect to continue doing so in future, please tick the appropriate values in both columns*).

	Value achieved to date	Future value
Up to £250,000		
£250,000–£499,999		
£500,000–£749,999		
£750,000–£999,999		
£1m		
Over £1m [please specify]		
D/k		

33. (a) When did you begin to access new markets or customers and (b) how long do you expect to operate in these markets as a result of your involvement with the SSCN?

33a: Accessed new markets/customers in....		33b. Expect to continue to operate in these markets till....	
2005		2012	
2006		2013	
2007		2014	
2008		2015	
2009		2016	

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2010		2017	
2011		2018 and beyond	
Don't know		Don't know	

34. Which of the following outcomes have you experienced as a result of your support from the SSCN? Please provide an *estimate* of the *annual* financial value of each outcome experienced even if it is only indicative.

	No	Yes	Annual Value
Contract R&D			
IP: Invention disclosures			
IP: Prototypes			
IP: Proof of principle study			
IP Protection			
Publications			
Charges from facilities/equipment			
Royalty Payments			
Enhanced external reputation			
Attracted new talent			
Retained talent			
Strengthened research expertise			

Wider Impact

35. On a score of 1 to 5 where 1 is not at all and 5 is greatly...

	1	2	3	4	5	DK
To what extent has the SSCN supported the development of the Scottish stem cell sector?						

36. If the SSCN did not exist how would this have affected the developmental stage of the Scottish stem cell sector?

It would be in exactly the same position as it is
It would not be as advanced as it is now
It would be ahead of where it is now
Don't know

Section 5: Future Role and Service Charges

37. On a score of 1 to 5, where 1 is not very important and 5 is very important, going forwards, how important is it that there is an organisation that is able to ...?

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	1	2	3	4	5	DK
Promote collaboration between different parties active within the Scottish stem cell sector, overcoming any professional, disciplinary and geographic barriers.						
Co-ordinate activities undertaken by various types of organisations within the Scottish stem cell sector?						
Provide a focal point for interaction between the Scottish cell community and overseas companies and researchers						
Encourage and assist with the commercialisation of research within the Scottish stem cell sector?						
To promote public understanding of developments within the Scottish stem cell sector						
Promote Scotland's profile on the international stage as a centre of excellence within the stem cell field						
Speak on behalf of the Scottish stem cell sector to policymakers and regulators						

Given the constraints under which public sector bodies are operating, Scottish Enterprise may not be able to fund the Network to the same scale as in the past. Scottish Enterprise and SSCN are exploring ways in which the Network can raise funds independently. They would like your views on service charges.

38. Would you prefer the Network to introduce annual membership fees or charge for specific events and resources?

Annual individual membership fee without any further charge to attend events or access resources	
Annual institutional membership fee without any further charge to attend events or access resources	
A pay-as-you go system with charges made for services or resources accessed without an individual or institutional membership fee	
A combination of an institutional fee and service charges	
Don't know	

39. How much would you/your organisation be willing to pay for an annual membership fee?

£25 - £50	
£51 - £100	
£101 - £250	
£251 - £500	
£501 - £1,000	
More than £1,000 [please specify]	
Don't know	

40. How much would your organisation be able to pay for bespoke services/assistance as part of a corporate sponsorship package?

£25 - £50	
£51 - £100	
£101 - £250	
£251 - £500	
£501- £1,000	
More than £1,000 [please specify]	
Don't know	

Section 6: Final Comments

41. Please use the space below to add any further comments you may wish to make about the role and impact of the SSCN.

Thank-you for your participation.

