

M00139504C
UC09000524

10236829



650.072
JEN

Abbey Bookbinding
Unit 3, Gabalfa Workshops
Clos Menter
Excelsior Ind. Estate
Cardiff CF14 3AY
Tel: +44 (0)29 2062 3290
Fax: +44 (0)29 20625420
E: info@abbeybookbinding.co.uk
www.abbeybookbinding.co.uk

**FOR USE IN
LIBRARY ONLY**

Library and Information Services
University of Wales Institute, Cardiff
Llanharau Road
Llanharau
Cardiff
CF23 9XR



**PRIFYSGOL CYMRU
THE UNIVERSITY OF WALES**

ENGAGING SCIENCE: A PERFORMANCE AND ACCOUNTABILITY FRAMEWORK FOR SCOTLAND'S SCIENCE CENTRES

PAUL DEAN JENNINGS MSC, MBA

Thesis submitted to the Cardiff School of Management in partial fulfillment of
the requirements for the degree of Doctor of Business Administration

My research was undertaken under the auspices of the University of Wales
Institute, Cardiff

Director of Studies: Professor Rebecca Boden

Second Supervisor: Professor Eleri Jones

Date of Submission: 6th February 2009



**Cardiff School of Management
Colchester Avenue
Cardiff, UK, CF23 9XR**

DECLARATION

I declare that this work has not previously been accepted in substance for any degree and is not being concurrently submitted for any other degree. I further declare that this thesis is the result of my own independent work and investigation, except where otherwise stated (a bibliography is appended). Finally, I hereby give consent for my thesis, if accepted, to be available for photocopying and for inter-library loan, and for the title and abstract to be made available to outside organisations.

Paul Jennings (Candidate)

Professor Rebecca Boden (Director of Studies)

Research and Supervisor)

ACKNOWLEDGEMENTS

Greatest thanks go to my family. My extended period of study has, at times, taken a heavy toll on family life and required as much an investment and commitment from my family as it has from me. Maggie, Charlotte and Phoebe thank you for your patience – I dedicate this work to you.

I would also like to thank my Mum and Dad whose faith in me over the years has been unwavering. Without both of you I would not be here today and your belief in me means more than you know - we've come a long way. I also share the dedication of this work with both of you as without your moral and practical support I would have struggled to finish – thank you.

My investigation involved recruiting a large group of senior science centre professionals from the UK, US, Canada, mainland Europe and Australia. The outputs of my investigation are much richer thanks to the time and effort invested by this group and I would like to thank all of them for their participation.

Lastly, I would like to thank Professor Eleri Jones and Professor Rebecca Boden for their stewardship through the professional doctorate programme. I would like to give particular thanks to Professor Jones who has now given me sound guidance through three post graduate qualifications – an MSc, MBA and now DBA. This period of extended study stretches to over 13 years and Eleri's consistently good and down to earth advice and support has been genuinely invaluable to me – thank you Eleri.

February 2009
Paul Jennings

ABSTRACT

Science is critical to the knowledge economy and UK science centres, many of which appeared in the new millennium, are perceived an effective vehicle for the promotion of public engagement with science (PES). Following trading difficulties in 2004 Scotland's four science centres (Dundee Science Centre, Glasgow Science Centre, Our Dynamic Earth and Satrosphere) entered into a funding relationship with the Scottish Executive (now Government) which also effectively created the Scottish Science Centres Network (SSCN) - the first national network of science centres in Europe. The early funding model employed by the government involved deficit-funding centres resulting in the centres losing most money receiving most funding. Informed by several independent reviews, the Scottish Government is now adopting a performance-based funding model. However such a model required a performance framework and key performance indicators (KPIs) for the SSCN which, to date, has proved elusive despite several cyclical attempts. The principal research question underpinning this study is: How can government funding of science centres better facilitate government policy on PES? Drawing on the experience of an international knowledge-community of senior science centre professionals, over two rounds of interviews, a significant amount of data on the alternative funding models and composite performance indicators was collected. This data was fed into two meetings of the senior representatives of the SSCN and led to the development of a new performance framework for the SSCN complete with seventeen KPIs. This represents an important milestone in advancing SSCN efforts to better demonstrate their economy, efficiency and effectiveness in return for continuing public funding. The framework is of sufficient generality to be of benefit to science centres outside Scotland and notably those centres who have still to convince their governments of the contribution they could make to advancing government's growing interest in PES in return for a funding relationship.

GLOSSARY OF ACRONYMS

ASPAC – Asia / Pacific Association of Science Centres
ASTC – American Association of Science and Technology Centres
COPUS – Committee for Public Understanding of Science
CPD – Continuing Professional Development
DCMS – Department for Culture, Media and Sport
DSC – Dundee Science Centre
ECSITE – European Collaboration for Science, Industry and Technology Exhibitions
ECISTE-UK – UK branch of ECSITE
FTE – Full Time Equivalent
GLOs – Generic Learning Outcomes
GSC – Glasgow Science Centre
HEIs – Higher Education Institutions
HMIE – Her Majesty’s Inspectorate of Education
JEG – Joint Executive Group
KPIs – Key Performance Indicators
MC – Millennium Commission
MOSI – Museum of Science and Industry, Manchester
NGOs – Non-departmental Government Organisations
NMG – National Museums and Galleries
NMSI – National Museum of Science and Industry
NSF – National Science Foundation
OCR – Office of the Chief Researcher
OCSA – Office of the Chief Scientific Advisor (for Scotland)
ODE – Our Dynamic Earth
OSC – Ontario Science Centre
PES – Public Engagement with Science
PIs – Performance Indicators
POS – Public Ownership of Science
POST – Parliamentary Office of Science and Technology
PUS – Public Understanding of Science
RBINS – Royal Belgian Institute of Natural Sciences
SDC – Science and Discovery Centre
SMART – Specific, Measurable, Achievable, Relevant and Time-based
SMC – Scottish Museums Council
SNP – Scottish National Party
SSCN – Scottish Science Centres Network / the Network
STEM – Science, Technology, Engineering and Mathematics
TBI – The Big Idea
VFM – Value-for-Money

TABLE OF CONTENTS

Declaration	i
Acknowledgments	ii
Abstract	iii
Glossary of Acronyms	iv
Table of contents	v
List of tables	ix
List of figures	x

CHAPTER ONE: CONTEXT, CHANGE AND SCOTLAND'S SCIENCE CENTRES

1.0	INTRODUCTION	1-2
1.1	WHAT IS A SCIENCE CENTRE?	1-5
1.2	FUNDING SCIENCE CENTRES	1-7
1.3	THE SCOTTISH SCIENCE CENTRES	1-9
	1.3.1 The science centre movement in Scotland	1-9
	1.3.2 Scottish science centre funding	1-10
	1.3.3 Performance measurement	1-12
1.4	PURPOSE AND SCOPE OF THESIS	1-14
	1.4.1 Aims and objectives	1-15

CHAPTER TWO: A NEW MODEL FOR PUBLIC ENGAGEMENT WITH SCIENCE?

2.0	INTRODUCTION	2-2
2.1	THE CHANGING NATURE OF SCIENCE	2-4
	2.1.1 The experience of UK higher education institutions	2-8
2.2	DEVELOPMENTS IN THE PUBLIC UNDERSTANDING OF SCIENCE MOVEMENT	2-10
	2.2.1 UK government interest in promoting PES	2-15
	2.2.2 Government's commitment to PES	2-17
	2.2.3 The contribution of science centres	2-18
2.3	THE INFLUENCE OF FUNDING AND ACCOUNTABILITY MEASURES/Frameworks	2-25
2.4	TOWARDS A SHARED PERFORMANCE AND ACCOUNTABILITY MODEL	2-30
2.5	SUMMARY	2-31

CHAPTER THREE: RESEARCH APPROACH

3.0	INTRODUCTION	3-2
3.1	CONSIDERATION OF DATA NEEDED	3-3
3.2	PHILOSOPHY	3-4
	3.2.1 Pragmatism	3-4
3.3	RESEARCH DESIGN	3-4
	3.3.1 Action-Research	3-5
	3.3.2 Participant observation	3-7

3.4	RESEARCH METHODS	3-8
3.4.1	Building and utilising an international knowledge-community	3-10
3.4.1.1	<i>Sampling method</i>	3-11
3.4.1.2	<i>Validity/reliability of research</i>	3-13
3.4.1.3	<i>Interviews/semi-structured questionnaires</i>	3-13
3.4.1.4	<i>Analysis</i>	3-15
3.4.2	Scotland's stakeholders – building consensus	3-16
3.5	SUMMARY	3-16

CHAPTER FOUR: RECENT PRACTICE IN SCOTLAND

4.0	INTRODUCTION	4-2
4.1	ARCHIVAL EVIDENCE	4-3
4.1.1	Early discussions	4-4
4.1.2	A developing relationship and growing expectations	4-8
4.1.3	A new science champion for Scotland	4-10
4.2	THE CONCEPT OF A NATIONAL SCIENCE CENTRE	4-12
4.3	THE SCOTTISH SCIENCE CENTRES NETWORK 2005-09	4-14
4.4	THE SCOTTISH SCIENCE CENTRES NETWORK AND SCIENCE EDUCATION	4-16
4.5	SCOTLANDS SCIENCE CENTRES – IMPACTS AND FUTURE INTERVENTIONS	4-18
4.5.1	Cause for concern	4-20
4.6	DEVELOPMENTS WITHIN THE WIDER UK SDC SECTOR	4-21
4.6.1	The funding of science and discovery centres	4-21
4.6.2	Inspiration, engagement and learning: The value of science and discovery centres in the UK working towards a benchmarking framework	4-23
4.6.3	The impact of science and discovery centres: A review of worldwide studies	4-24
4.7	SUMMARY	4-25

CHAPTER FIVE: FUNDING AND PERFORMANCE MANAGEMENT MODELS IN DIFFERENT COUNTRIES

5.0	INTRODUCTION	5-2
5.1	AN INTERNATIONAL KNOWLEDGE-COMMUNITY	5-3
5.1.1	The development of science centres	5-4
5.1.2	Size of main exhibition space	5-6
5.1.3	Annual visitor attendance	5-14
5.1.4	Main elements to science centres	5-14
5.2	EXPERIENCE OF WORKING WITH GOVERNMENT	5-15
5.2.1	Existing funding relationships with government	5-15
5.2.1.1	<i>Benefits of a relationship with government</i>	5-23
5.2.1.2	<i>Reporting requirements of government</i>	5-26
5.2.2	Awareness of other funding models	5-27
5.2.3	Science centres and government policy on PES	5-28
5.2.4	Government expectations of a funding relationship	5-31
5.2.5	The wider science-in-society community	5-31
5.3	THE USE OF PERFORMANCE MODELS OR INDICATORS BY OTHERS	5-32
5.3.1	Other best practice examples of performance indicators	5-33
5.3.2	Structuring a new framework	5-35
5.3.3	Limitations of current performance models	5-37
5.4	SUMMARY	5-38

CHAPTER SIX: AN EMERGENT MODEL

6.0	INTRODUCTION	6-2
6.1	EMERGENT THEMES	6-3
	6.1.1 Performance models	6-5
	6.1.2 Performance indicators	6-6
	6.1.3 Use of methodology	6-10
6.2	POTENTIAL FOR A NETWORK PERFORMANCE MODEL	6-12
	6.2.1 Variables and comparability	6-13
	6.2.2 Emphasis of a network model	6-16
	6.2.2.1 <i>An equitable approach to funding</i>	6-17
	6.2.3 Common evaluation	6-19
	6.2.4 The influence of government	6-21
6.3	SUMMARY	6-23

CHAPTER SEVEN: CONSENSUS BUILDING ON THE NEW MODEL

7.0	INTRODUCTION	7-2
7.1	THE SCOTTISH GOVERNMENT AND OPERATIONAL FUNDING 2008-11	7-3
	7.1.1 Performance measures and key performance indicators identified by the Scottish Government	7-6
7.2	REACTIONS OF THE SCOTTISH SCIENCE CENTRES TO RESEARCH SO FAR	7-9
	7.2.1 Doctorate update	7-10
	7.2.1.1 <i>Defining a 'paying visitor'</i>	7-13
	7.2.2 An emerging model	7-14
	7.2.3 Advancing a common methodology	7-15
7.3	REFLECTING THE CHANGING ENVIRONMENT	7-16
7.4	ADVANCING THE KEY PERFORMANCE INDICATORS	7-21
7.5	SECURING CONSENSUS OVER A NEW SSCN PERFORMANCE FRAMEWORK	7-23
7.6	SUMMARY	7-27

CHAPTER 8: CONCLUSIONS

8.0	INTRODUCTION	8-2
8.1	REVIEW OF RESEARCH OBJECTIVES	8-3
8.2	ACHIEVING MY RESEARCH AIM	8-6
	8.2.1 The benefits of funding a business efficiency model	8-7
	8.2.2 The fit of an agreed performance framework to a diverse SSCN membership	8-8
	8.2.3 The transferability of a Scottish model to other science centres	8-9
8.3	MY PRINCIPAL RESEARCH QUESTION	8-11
8.4	THE CONTRIBUTION OF MY RESEARCH	8-13
	8.4.1 Contribution of research to theory	8-13
	8.4.2 Contribution of research to practice	8-13
8.5	LIMITATIONS	8-14
	8.5.1 Limitations of research	8-14
	8.5.1.1 <i>Resource</i>	8-14
	8.5.1.2 <i>Approach</i>	8-14
	8.5.1.3 <i>External factors</i>	8-16
	8.5.2 Limitations of performance framework model	8-16
	8.5.2.1 <i>Scottish context</i>	8-16
	8.5.2.2 <i>An outputs based framework</i>	8-17
	8.5.2.3 <i>Adoption of the new framework</i>	8-17

8.6	FUTURE RESEARCH OPPORTUNITIES	8-17
8.7	PERSONAL REFLECTIONS	8-19
	8.7.1 Personal understanding	8-19
	8.7.2 Strategic perspective	8-19
	8.7.3 Future research interests	8-20

CHAPTER NINE: DOCTORATE UPDATE

9.0	INTRODUCTION	9-2
9.1	ADVANCING A FRAMEWORK FOR SCOTLAND'S SCIENCE CENTRES	9-3
9.2	MOVING FROM PERFORMANCE AND ACCOUNTABILITY TO EVALUATION	9-4
	9.2.1 Implementation timetable	9-11
9.3	A COMPARISON OF FRAMEWORKS	9-12
9.4	NEXT STEPS	9-13

REFERENCES

APPENDICES

Appendix 1	Research Contact Sheet – Phase 1 Interviews
Appendix 2	Invitation to Potential Interviewees
Appendix 3	Research Contact Sheet – Phase 2 Interviews
Appendix 4	Interview one – Question Schedule
Appendix 5	Interview Structure
Appendix 6	Interview two – Question Schedule
Appendix 7	Scottish Executive Funding Announcement 2004
Appendix 8	Scottish Executive Paper – Measuring Success
Appendix 9	Scottish Executive Paper – Information for Network of Science Centres
Appendix 10	Scottish Executive Paper – Quarterly Performance Report / Claim for Payment
Appendix 11	Scottish Government Letter – Future Funding of Scottish Science Centres Network
Appendix 12	Scottish Government Letter – Scottish Government Operational Funding 2008-11: Call for Proposals
Appendix 13	Minutes of the SSCN meeting of 26 th February 2008
Appendix 14	Early Observations and KPIs which had emerged from the Interviews
Appendix 15	Minutes of the SSCN meeting of 20 th March 2008

ANNEX 1

Professional Development Portfolio

LIST OF TABLES

Table 3.1	Sources of evidence for case studies – strengths and weaknesses	3-9
Table 5.1	The knowledge-community science centres participating in the research	5-7
Table 5.2	Government funding of knowledge-community science centres – international comparator	5-16
Table 7.1	Annual network visitor target	7-5
Table 7.2	Sort-term outputs and long-term outcomes of the Scottish Government	7-6
Table 7.3	Deadlines for responding to Scottish Government requests for information	7-8
Table 7.4	Potential headline key performance indicators	7-15
Table 7.5	Scottish Government linked discussion framework	7-19
Table 7.6	Transactional performance framework between the Scottish Government and Scottish Science Centres Network	7-24
Table 9.1	Scottish science centre evaluation results chain	9-6
Table 9.2	Scottish Government evaluation framework	9-8
Table 9.3	Implementation timetable	9-11
Table 9.4	A comparison of KPIs	9-13

LIST OF FIGURES

Figure 1.1	The Scottish science centres	1-4
Figure 3.1	Action-Research Cycle	3-6
Figure 5.1	Age of centres	5-5
Figure 5.2	The size and cost of centres	5-6
Figure 5.3	Annual attendance figures	5-14
Figure 6.1	Emergent themes from round one interviews	6-3
Figure 6.2	Revenue funding for SSCN, 2004-2007	6-17
Figure 7.1	Early transactional model of DCMS	7-17

CHAPTER ONE

CONTEXT, CHANGE AND SCOTLAND'S SCIENCE CENTRES

1.0	INTRODUCTION	1-2
1.1	WHAT IS A SCIENCE CENTRE?	1-5
1.2	FUNDING SCIENCE CENTRES	1-7
1.3	THE SCOTTISH SCIENCE CENTRES	1-9
	1.3.1 The science centre movement in Scotland	1-9
	1.3.2 Scottish science centre funding	1-10
	1.3.3 Performance measurement	1-12
1.4	PURPOSE AND SCOPE OF THESIS	1-14
	1.4.1 Aims and objectives	1-15

CHAPTER ONE

CONTEXT, CHANGE AND SCOTLAND'S SCIENCE CENTRES

1.0 INTRODUCTION

Having been the chief executive of a science centre in Dundee, Scotland since October 2001, I have a legitimate interest in being able to effectively position myself and my organisation to better manage the waves of change that constantly challenge the medium and long-term sustainability of my business. The opportunity afforded through studying for this professional doctorate has been to prepare for, and tackle, a long-range issue of major strategic importance both to my own organisation and potentially others in the science centre sector, most notably the other three science centres in Scotland.

My thesis has developed out of a growing recognition, by me and others, of the need for science centres to develop their external stakeholder relations. One of the most important relationships for any science centre is the one which it shares with its government. Many centres continue to work towards securing greater advocacy or support from their government, notably, but not exclusively, in the pursuit of a funding relationship. Science centres often need this in order to realise a position of relative financial sustainability. In the UK, the role of lead negotiator for such a relationship has been taken on by the UK branch of the European Collaboration for Science, Industry and Technology Exhibitions (ECSITE-UK), a Science and Discovery Centre (SDC) membership organisation that in April 2008, published its report, *Inspiration, Engagement and Learning, The Value of Science and Discovery Centres in the UK Working towards a Benchmarking Framework*. This review of the value of the SDC

sector to the UK came in direct response to the recommendations of a House of Commons Select Committee review (2007) into the funding of UK science centres. Covered in more detail in chapter four, this review sought to establish the role of science centres in promoting public engagement with science (PES) and in mapping out the funding available to science centres from UK central government and other sources. As such the House of Commons review represents an important, albeit early, milestone in ECSITE-UK's efforts to advance its advocacy ambitions.

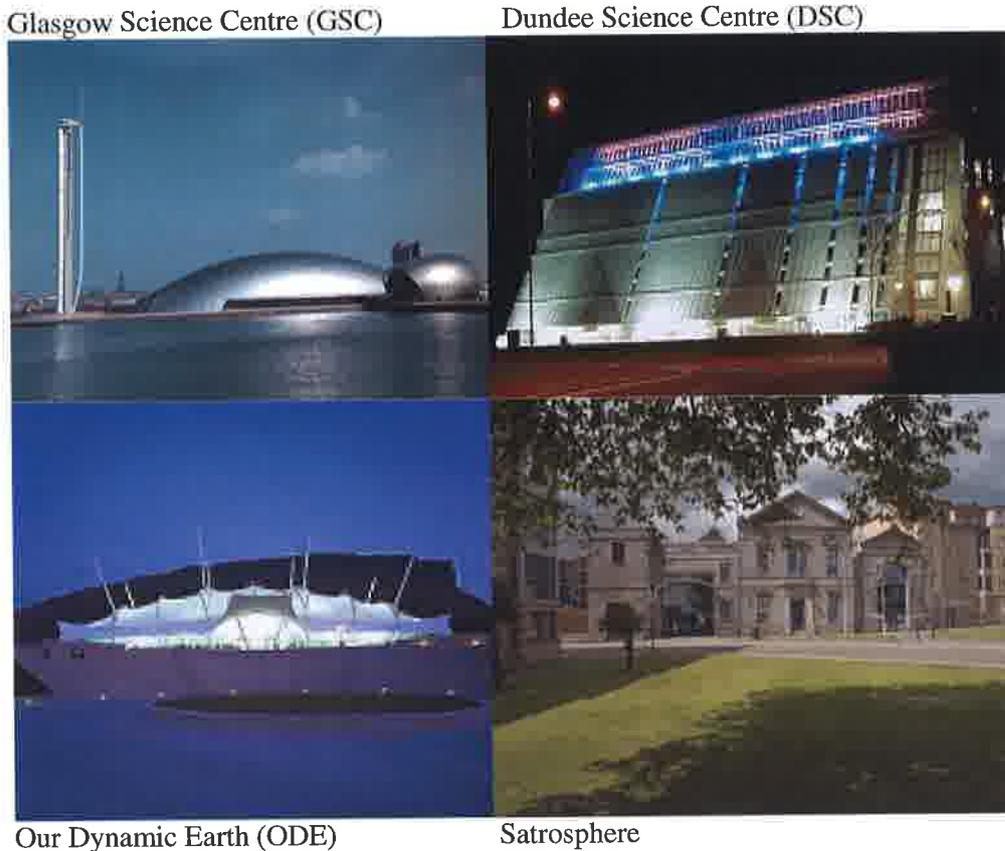
Notwithstanding their often vulnerable financial position, science centres can and do play an important role in promoting PES and in supporting government's growing interest in democratising science in society, something which I evidence in chapter five. Additionally, science centres have many other attractive qualities to offer their government in return for a funding relationship. I detail these more fully later in this and subsequent chapters.

Having already achieved a level of recognition from the Scottish Government¹ there remains an important opportunity for the four science centres in Scotland (see figure 1.1) to further develop their relationship with the Government. The steps to doing so are held in how the four Scottish centres can now better demonstrate their contribution to promoting PES, and in aligning their activity base with the Scottish Government's science-rooted policy interests and commitments in return for continued funding. My own contribution to date has been to work with the other Scottish science centre chief executives in efforts to build a strong relationship with, initially (2003) the Scottish

¹Formerly the Scottish Executive, the Scottish Government was formed following the election of the Scottish National Party (SNP) in May 2007. Future reference to the Scottish Executive will relate only to the period before May 2007.

Executive, under a shared Labour/Liberal Democrat leadership and now (2008) the Scottish Government, under the leadership of the Scottish National Party (SNP).

Figure 1.1 The Scottish science centres



The joint effort from Scotland’s chief executives during 2003 and 2004 importantly contributed to the establishment of a funding relationship with Government across all four centres, a relationship that is slowly becoming more mature and sophisticated in its expectation. This growing expectation has driven recent developments in performance reporting across all four centres in Government’s efforts to better demonstrate the economy, efficiency and effectiveness of the science centres in delivering against Government interests related to PES and science learning.

In contrast to Scotland’s favorable, albeit evolving, position many science centres, including those in England, have yet to convince their governments that they could become an important and credible player in driving governments’ PES ambitions. Efforts to do so will likely continue far beyond the timescales associated with my investigation.

In setting an early context for my investigation chapter one has four parts. In part one, I introduce the role of science centres and the nature of their contribution in promoting PES. In part two I elaborate on the current funding of science centres across the UK, a situation which has left many financially vulnerable. In part three, I concentrate on the recent context for change in Scotland, changes that have led to the Scottish science centres securing Government funding and by default the creation of the Scottish Science Centres Network (SSCN), the first nationally-funded network of science centres in Europe. Lastly, in part four, I consider the emergent research question that comes out of the SSCN context and describe the associated aims and objectives that determined the nature of my investigation and by association the shape and content of the remainder of my thesis.

1.1 WHAT IS A SCIENCE CENTRE?

Science centres fulfill a dual purpose as visitor attractions and educational venues. They aim to present science in an informative and engaging manner to a visiting public of all ages. All seek to provide an environment that encourages informal learning by striking a balance between education and entertainment. More broadly, science centres are often referred to as belonging to the SDC sector. This term is typically employed by science centre membership organisations in welcoming a wider membership than just science

centres. Examples of venues that better fit the broader SDC label include zoos and aquaria. The focus of my investigation is firmly grounded in the science centre and so I only use the term SDC when specifically referring to the wider group.

In describing what a science centre is, a brief description by ECSITE-UK (2008a, p.2) is as useful a starting point as any:

At their core (science centres have) interactive exhibitions and programmes inviting visitors to explore, experiment, test, predict and discover science and the world around them.

Most have a permanent exhibition, space for temporary exhibitions and offer a growing range of activities that typically now includes science, technology, engineering or maths (STEM) based shows, workshops, public debates and lectures. Many also offer outreach activities, where science centre staff go out to groups that often find making a visit to the science centre difficult, whether this be for economic, geographic or time-related constraints.

The intrinsic nature of the science centre is such that they can and do play an important role in supporting the formal education sector and serve a range of purposes, including engaging the public in considering the role and value of science to society, informing the public about scientific advancements, promoting science as a career path and bringing different STEM related stakeholders together in a neutral environment.

The broader appeal of science centres as popular visitor attractions and cultural venues is also critical to their success and places them in an enviable position of being able to attract a sizeable and increasingly diverse audience. In 2005-06 UK-based SDCs

attracted 19,503,000 visitors (Gammon and Harris, 2006, published in ECSITE-UK, 2008a), almost a third of the UK’s population.

1.2 FUNDING SCIENCE CENTRES

The UK’s science centres are typically not-for-profit, charitable organisations that exist to discharge their charitable aims related to education and PES. The nature of these organisations is such that many struggle to cover operating costs through earned income. This constrains the ability of many to contribute fully to the educational and science learning agenda to which most subscribe.

While a small number of the UK’s science centres have been in existence for 15 years or more, many have appeared since the turn of the new millennium. These have been supported by funds from the Millennium Commission (MC) and others, notably The Wellcome Trust, European Union, regional and local government and commercial and not-for-profit sponsors. One in five UK millennium projects and schemes had a science/technology element, with over £250 million having been awarded to fourteen science/technology centres (Parliamentary Office of Science and Technology (POST), 2000) across the UK.

MC funds were of a capital nature only, with no revenue support element. A condition of MC funding was that the recipients were financially self-supporting, an important point as few of the MC-funded science centres have achieved this. Those that have secured a measure of financial sustainability usually have a major asset base that has additional earning potential, e.g. commercial letting of office space, pay and display car parking, facilities for hosting corporate events. The Parliamentary Office of Science and Technology (POST, 2000) identified financial sustainability of UK SDCs as a real

threat prior to the majority of MC-funded projects opening, albeit no advance provision was made for this. As early as 1998 the anticipated financial shortfall of UK SDCs was predicted at £50m per year (Beetlestone, Johnson, Quin and White, 1998). More recently (2002), ECSITE-UK estimated the gap between earning capacity and cost of delivery to be £35m a year. As the MC-funded SDCs have aged so their associated running costs are likely to have escalated and, in all likelihood, surpassed earlier ECSITE-UK estimates. The problem is a major one and set to grow until such time as a long-term funding solution can be identified and secured.

While few of the UK's SDCs receive government subsidy there are a small number of noteworthy examples that do. In Wales, Techniquet in Cardiff receives funds totaling 31% of its operating revenue (interview with Techniquet chief executive Peter Trevitt, 2007) from the Welsh Assembly Government. In Belfast, W5 receives 10% of its revenues from its devolved administration (information provided by the financial controller of W5, 2007). Most recently (2004), the Scottish Executive committed a budget line with both capital (exhibit/asset renewal) and revenue (to cover operating costs) elements to the four Scottish science centres. I describe the development of this relationship in section 1.3.

None of England's science centres currently receive any sustainable form of government funding. The key issue for England appears to be the large number of SDCs and associated funding levels required when compared with the relatively few SDCs found in Wales, Scotland and Northern Ireland. The ongoing discussions between ECSITE-UK and the House of Commons Select Committee on Science and Technology, mentioned earlier, are an encouraging starting point.

1.3 THE SCOTTISH SCIENCE CENTRES

1.3.1 The science centre movement in Scotland

The science centre movement in Scotland is still in its relative infancy. The first science centre to open in Scotland was Aberdeen's Satrosphere in 1989. Satrosphere was one of a small number of early UK science centres that included Techniquest in Cardiff and the Exploratory in Bristol. While Techniquest continues to operate, the Exploratory closed in 1999 and was replaced by the MC-funded science centre, @t-Bristol. Scotland's other three science centres Dundee Science Centre (DSC), Glasgow Science Centre (GSC) and Our Dynamic Earth (ODE) all appeared at the beginning of the new millennium and were all supported by major capital awards from the MC and others. The four centres are very diverse, differing in scale, scientific focus, asset base and audience. The chief executives of the centres believe this diversity to be a strength. Each of the four centres operates as a discrete and separate legal entity, governed by Scottish charity law but otherwise with different structures, sets of trustees and, other than the Scottish Government, separate sponsors/funders.

Despite the relatively recent arrival of three of the four centres, all have experienced early, and in some cases ongoing, financial difficulty. In 2003 the financial problems across the four centres were such that their chief executives made a collective approach to the Scottish Executive in efforts to secure a much-needed funding relationship. As a direct result of this approach the Scottish Executive commissioned Jura Consultants, a firm of economic and financial analysts based in Edinburgh, to carry out an independent review of Scotland's science centres with a view to potentially providing ongoing public funding. The science centres reviewed included DSC, GSC, ODE, Satrosphere and The Big Idea (TBI) in Irvine. Shortly after Jura was commissioned TBI, also an

MC-funded science centre, went into administration. This was a key event in negotiations between the science centres and the Scottish Executive as it demonstrated the vulnerability of the centres in the clearest possible way. It also signposted that others could quickly follow if early action was not taken. Jura (2004a, p.ii) noted that:

The Scottish science centres have shared the same experience as the science centres elsewhere in the United Kingdom, and also some of the other projects funded by the National Lottery Distributors. Initial visitor forecasts have generally been over optimistic leading to inflated income projections, which in turn have lead to the creation of substantial enterprises with significant overheads. Periods of rapid and radical adjustment have followed, more rapid and more radical and more effective in some centres than in others. However, these adjustments cannot address the weaknesses of the underlying business models which are frequently focused on a single activity and market.

Prior to this dialogue the Scottish science centres had had little experience of working with each other and the proximity of GSC to TBI was even cited as a possible contributor to the demise of the smaller project which was based in a less-densely populated area of the country (BBC, 2003).

1.3.2 Scottish science centre funding

As a consequence of the closure of TBI, along with the findings presented by Jura, Scottish ministers agreed to an initial funding package for the four science centres of £5.1M in June 2004. This included £1M for collaborative education activity between centres. A budget line of £3.7M a year was subsequently agreed by ministers to cover the period up to the next comprehensive spending review in 2007.

Other than by way of lip-service, the ability of the newly-created SSCN to contribute to either a political or educational agenda did not appear to rank highly with Government during these early discussions albeit this position has changed considerably during the

intervening years. This shift coincided with the transfer of responsibility for the SSCN, within the Scottish Government, from the Department of Enterprise and Lifelong Learning to the Office of the Chief Scientific Advisor for Scotland (OCSA). Since this change the environment has become a more accountable one for the SSCN centres with the Government now having far higher expectations of centres in driving appropriate education and public engagement-related outputs.

The early, and in many ways flawed, funding model implemented by the Scottish Executive was to ‘deficit-fund’ each of the centres. This effectively saw the science centres making the greatest financial losses rewarded by receiving the highest percentages of funding. Driven in this way by ministers’ desires to see all four centres continue to operate through a turbulent period, the funds were additionally subject to reform outlined by Nicol Stephen, the then Deputy First Minister and minister for Enterprise and Lifelong Learning in his foreword to the inaugural strategy of the SSCN (SSCN, 2005, p.1):

In 2004 the Scottish Executive launched the first sustained programme of support for Scotland’s four science centres. At the same time to ensure their long-term viability, we asked the science centres to make fundamental changes to their ways of working. We wanted to see more collaboration, less competition and more robust business planning.

The creation of this early joint strategy provided a much-needed focus for bringing a group of organisations that had had little previous experience of working with each other together. This, as noted below by Nicol Stephen (SSCN, 2005, p.1), sought to position the centres at the forefront of the drive to highlight Scotland’s pro-science outlook.

Ultimately the science centres have the potential to underpin our knowledge-economy, by turning our children and young people on to science, inspiring future generations of scientists, and helping to achieve greater public involvement in the debate about the place of science in society.

The ability of the SSCN to demonstrate pro-active delivery against this and an efficiency and commercialisation agenda were viewed as key to their continuing dialogue with the Scottish Executive beyond this initial funding period. The reality, however, has been that the SSCN took the duration of this first term of funding to recover a degree of financial sustainability and to begin finding its feet as a network.

The SSCN strategy identified four objectives, to be delivered by 2007/08, which bear relevance to my thesis. First, the level of financial support for science centres should be more strongly linked to outputs. Second, further opportunities for streamlining across all centres should be considered. Third, that an evaluation report should be commissioned in order to measure the progress made by centres. Lastly, a review of network strategies should be undertaken in efforts to determine the effectiveness of collaborative activity between centres. These objectives sat against the additional and broader needs of the Scottish Government around public engagement and democratising science, identified in the introduction of this chapter.

1.3.3 Performance measurement

The Scottish Government’s financial support for the SSCN is made on the basis of centres demonstrably securing best value-for-money (VFM) for the Government’s investment of public funds. As a function of this the four SSCN members are required to complete quarterly performance returns to the Government. These returns, the development of which is described more fully in section 4.1.2 of chapter four, report

performance against a number of areas, including visitor numbers, financial performance against budget and progress against delivery of education plans. The four centres have also been subject to regular inspections by Her Majesty’s Inspectorate of Education (HMIE). The last inspection² of the SSCN by HMIE was carried out in September 2006. This review, published in 2007, helped shift the emphasis of Scottish Government funding in 2007/08 towards improving the quality of education-related outputs and better supporting the delivery of prevailing Government policy related to science education. While the SSCN has this existing reporting requirement to the Scottish Government its emphasis on performance outputs fails to give any focus to performance outcomes, those aspects of the centres work most closely associated with their mission.

The need for stronger performance reporting across the wider SDC sector has previously been identified by ECSITE-UK, in its 2002 report, *‘Science and Discovery Centre: Capitalising on 20 Years’ Investment’*. In this report ECSITE-UK highlighted the need to establish a performance framework with robust indicators and benchmarks, with agreed definitions, in order to measure delivery against agreed targets. The absence of any such framework has slowed the advance of both the SSCN and the wider UK SDC community as without this many potential funders, including UK central government, continue to question the real value of science centres. That ECSITE-UK has only recently (April, 2008a) published its report into advancing a benchmarking framework suggests that this is not so easily achieved.

² The inspection of the SSCN centres by HMIE in 2006 was the centres second. The four centres were first inspected by Her Majesty’s Inspectorate of Education in 2002 as part of a UK-wide review of science centres led by the Department for Trade and Industry (DTI).

A previous attempt (by the Scottish Executive) to identify a suitable performance measurement framework, with associated performance indicators (PIs), failed due to the difficulty in identifying appropriate indicators and a lack of commitment by SSCN centres, notably but not exclusively due to a lack of involvement in the development process. Involving SSCN centres from the outset of my own research has aided the degree to which the outputs of my investigation are deemed acceptable by centres.

The relative absence of suitable and widely accepted PIs within the science centre community highlighted a need to consider other comparable sectors, e.g. museums and galleries, in helping establish early pointers for my research. I consider this in chapter two.

It is argued that a suitable and balanced framework will allow funders, including the Scottish Government, to make better informed and more equitable decisions over the future distribution of grants to the science centres and provide a further means of demonstrating responsible planning and sound governance by the science centres, another priority expressed by the Scottish Government.

1.4 PURPOSE AND SCOPE OF THESIS

The context in which Scotland’s science centres operate has changed considerably since its earliest dialogue with the Scottish Government. As Government expectations of the centres has grown so has its interest in being able to better measure and report the performance of centres against their contribution to advancing PES and securing best value for its investment of public funding. The desire of the Scottish Government to see the SSCN support its ambitions for widening PES gave rise to my principal research

question, *‘How can government funding of science centres better facilitate government policy on PES?’*.

While referring to the English museum sector, comments made by Lawley (2003), that museums are not homogenous, has not been lost on my investigation as each of the four science centres in Scotland is very different. The early warning from Lawley was that a one-size-fits-all model for delivering economy, efficiency and effectiveness across all members of the SSCN would prove difficult to identify, agree and administer. That senior SSCN representatives, from across the network, played a central role throughout my investigation, and gave their support and endorsement for my investigation from the outset, is important in providing an early signpost to the potential usefulness of the performance and accountability framework which emerged from my investigation.

1.4.1 Aims and objectives

My research aim in undertaking this investigation has been the establishment of a performance and accountability framework for use by members of the SSCN and which meets the requirements of the Scottish Government. In advancing this a number of additional research questions emerged including what is the basis for funding a business efficiency model when, arguably, the major outputs of SDC’s are associated with education and promoting PES?; Would an emergent performance framework fit all SSCN members?; How transferable would a performance framework developed in Scotland be within a wider UK or international context? My approach has also accounted for factors that may influence the degree of adoption of any emergent performance framework across the SSCN science centres. In addressing both research questions and research aim I identified the following research objectives:

- 1) Consider the changing nature of science, the drivers of this and the role of science centres in helping fulfill government’s interest in PES;
- 2) Consider relevant management practices to include management of public funds;
- 3) Conduct a situational analysis of factors influencing recent change, employing appropriate environmental scanning tools;
- 4) Identify good practice in relation to performance frameworks, associated performance indicators and their implementation across formal and/or informal networks;
- 5) Consider an emergent model that is appropriate for the Scottish context, making comparisons and drawing out lessons to be learnt from others;
- 6) Share findings of research with major Scottish stakeholders in efforts to achieve a consensus position.

The preferred outcome of the SSCN, in advancing the development of an agreed performance framework, was that rather than penalising ‘poor’ performance against any jointly-agreed measures, that there be a recognition and reward system for positive behaviour and performance and creation of an environment for sharing learning and best-practice across the SSCN. This proved important in securing the necessary ‘buy-in’ from all centres. This approach also held greatest potential for advancing the Scottish Government’s recently (February 2008) expressed desire to see centres move away from its early deficit-funding model to one which better reflected the performance of centres. This shift in emphasis by Government, announced with the news that the SSCN had secured a second round of Government funding (February 2008), supported the need for a new approach to performance management and reporting.

The scope of such a short investigation has meant that the implementation of any agreed outputs will take place after the completion of my thesis. Accordingly, my thesis is set into a further eight chapters.

In chapter two, I review the available literature on the changing nature of science during the last thirty years, its influencers and affect on public attitudes toward science and those seen as controlling it. My review also considers the growing interest of governments in promoting PES and begins a longer discussion around how science centres might support government in this area of developing interest. I also highlight the growing accountability agenda of governments in considering existing performance reporting measures, their effectiveness/use in other sectors and potential transferability to the science centre field. I close chapter two with my views around whether the available literature supports the potential for creating a shared performance framework for adoption by the four SSCN science centres. My literature review advances the address of my first two research objectives.

In chapter three, I describe my research approach to the fieldwork phase of my investigation in advancing my research aim. Consideration of my data requirements, the likely challenges of gathering this data and the theoretical foundation of my research underpins my choice of research design and the specific research methods I employed in gathering and analysing my data. Choices made here have a direct influence on the validity of my data and as a result my whole investigation.

In chapter four, I describe in detail the period of change experienced by Scottish science centres since their earliest dialogue with the Scottish Executive in 2003. I build on my brief introduction to the four Scottish centres made in section 1.3 of this chapter and

draw from a significant body of archival material, collected over the last five years. This material charts some of the key communications between the science centres and the Scottish Executive/Scottish Government and is supported by periodic, independent, review material commissioned by the Government. Collectively, this material follows a timeline of events that charts how the Scottish Government’s thinking towards, and expectations of, the science centres has changed over the intervening years. Towards the end of chapter four I briefly consider recent developments in the wider UK science centre context as these have bearing on the fieldwork stage of my investigation.

In chapter five, I begin describing the data generated from two rounds of extensive telephone interviews with an assembled knowledge-community of senior science centre professionals, typically their chief executives, and drawn from the UK, US, Canada, Australia and mainland Europe. This chapter emphasises the experience of these individuals in working with their own governments and the use of performance models and associated performance indicators in their own centres. In this regard chapter five seeks to draw out the good and best practice being exhibited by others in efforts to inform a new approach for Scotland.

In chapter six, I draw on the emergent themes generated by my knowledge-community during my first round of interviews. These were fed into a second round of interviews in efforts to further develop each theme. In addition, chapter six captures the views of my interviewees around the potential for creating a common performance framework for adoption by the SSCN and covers areas such as variables, comparability, emphasis of a network-based model, common evaluation and the influence of government.

In chapter seven, I bring the work of my earlier chapters together in building towards the development of an early performance framework for consideration by all members of the SSCN. The work associated with this phase of my investigation, while drawing on the earlier inputs of my entire knowledge-community, focuses on the Scottish constituents of my knowledge-community only in efforts to work towards achieving a consensus position.

In chapter eight, I present my conclusions. In doing so, I review my research objectives, delivery against my research aim and explain the extent to which achieving these has allowed me to respond to my investigations principal research question. This includes describing my major findings and the extent to which my research has contributed to both theory and practice. I additionally point to both the limitations of my investigation and scope for future research. In concluding my thesis I close with some reflections on my professional doctorate journey.

In chapter nine, I provide a brief update of the course of events during the twelve months that followed the conclusion of the consensus building phase of my investigation (March 2008 – March 2009). These have direct bearing on the legitimacy of my research and address the major limitations of my investigation and for this reason represent an important post-conclusion addition to my thesis. This update also demonstrates the pervasive nature of organisational change and the external factors and influences that can drive this. In essence chapter nine represents an important preparation for the change which I referred to in the opening paragraph of chapter one.

CHAPTER TWO

A NEW MODEL FOR PUBLIC ENGAGEMENT WITH SCIENCE?

2.0	INTRODUCTION	2-2
2.1	THE CHANGING NATURE OF SCIENCE	2-4
	2.1.1 The experience of UK higher education institutions	2-8
2.2	DEVELOPMENTS IN THE PUBLIC UNDERSTANDING OF SCIENCE MOVEMENT	2-10
	2.2.1 UK government interest in promoting PES	2-15
	2.2.2 Government's commitment to PES	2-17
	2.2.3 The contribution of science centres	2-18
2.3	THE INFLUENCE OF FUNDING AND ACCOUNTABILITY MEASURES/Frameworks	2-25
2.4	TOWARDS A SHARED PERFORMANCE AND ACCOUNTABILITY MODEL	2-30
2.5	SUMMARY	2-31

CHAPTER TWO

A NEW MODEL FOR PUBLIC ENGAGEMENT WITH SCIENCE?

2.0 INTRODUCTION

In chapter one I considered change in the context of the Scottish Executive's decision to fund four science centres in Scotland. The Scottish Executive described this decision as a 'something-for-something' investment (SSCN, 2005), one which would likely see future funding of the centres tied more directly to them delivering against Government policy on PES, improving public awareness of, attitudes towards and ownership of science, with the longer-term aims of the centres contributing to the growth of Scotland's knowledge-economy and ultimately its economic competitiveness. The recent (April, 2008) continuation of a funding relationship between the Scottish Government and the SSCN, into a second phase of funding strongly suggests the Government still feels that the science centres have an important role to play in fulfilling its ambitions for PES and public ownership of science (POS) in Scotland.

Chapter one concluded with my setting out a research agenda and associated research questions that sought to identify how Government funding and the establishment of a performance management and accountability framework for the SSCN might be used to better facilitate Government policy on PES. I identified my research aim and objectives in setting out the scope of my investigation.

In chapter two I address my first two research objectives through considering the available grey and academic literature. In firstly addressing objective one and also

setting a wider context for my thesis I focus on the changing nature of science, the drivers of this change and the subsequent impact of this change on the UK public's views of science, its (the public's) relationship with government and those non-governmental organisations (NGOs) most closely associated with it. The impact of these changes on these NGOs, their legitimacy and effectiveness as government vehicles for PES and influence on their own relationships with the public are also considered.

I also describe developments in the field of the social sciences associated with PES, including UK government policy towards PES, government's move away from Public Understanding of Science (PUS) to PES, the potential benefits of better promoting PES in supporting wider policy on science and why governments seem increasingly keen to work with others in their continued efforts to better promote PES. This is an appropriate point at which to consider whether government commitment to promoting PES is well placed or whether bigger issues around the changing nature of science are more fundamental to government attempts to re-build public trust in, support for, and ownership of science. In closing this section, I consider the potential contribution of science centres in supporting government policy on PES and what consequences possibly await them as a result of such a relationship.

In addressing my second research objective I look at the influence of management and accounting practices on the changing nature of science and, more specifically, the influence of government funding on recipient organisations in their efforts to promote a PES agenda. I also highlight the presence of performance management and accountability measures in these organisations, their effectiveness in aiding delivery against government policy and degree to which they are transferable between sectors.

Based on their similarity in operational nature, education focus and emphasis on a visiting public, I also touch on the experience of the UK museums and galleries sector.

In closing chapter two I consider the scope for creating a shared performance framework for science centres, one that delivers against government aspirations towards better promoting PES and demonstrating accountability. Opportunities, challenges and gaps in the literature identified here helped inform my research approach, described in chapter three.

2.1 THE CHANGING NATURE OF SCIENCE

Prior to the mid 1970s, changes in the nature of science as a social practice were largely organic and self-managed in nature (Boden, Cox & Nedeva, 2006). The only scientific-citizens at this time were scientists themselves (Elam & Bertilsson, 2003). Since then the funding decisions of UK central government have seen the adoption of a more policy-led, exogenous, approach to science activity, which Boden et al (2006), describe as having been facilitated by the intersection of three interrelated discourses: a shift towards neo-liberal ideologies and discourses of government that has included the re-visioning of the nature and role of science as something that should directly impact on national economic competitiveness and which has allowed market forces greater reign in the pursuit of economy, efficiency and effectiveness; a consequent reconstitution of the relationship between government and science; and a resulting reshaping of science itself. In his November 2006 speech, *'Our Nation's Future'*, former UK Prime Minister, Tony Blair stated "*science will be as important to our economic future as stability*". The discursive shift in policy identified by Boden et al. (2006), which contextualised Blair's statement, is by no means unique to the UK, with almost all European countries now

pursuing the major objective of transforming their economies into knowledge economies (Jacob, 2003).

The actual or virtual relocation of science from a relatively independent, socio-economic space to either the private sector or a marketised public sector has led to what Boden et al. (2006) has described as a new ‘commodified’ model of science. In efforts to distinguish commodification from commercialisation, Jacob’s (2003) definition will be used in defining commodification of knowledge as the process by which knowledge is reduced to a format that makes it possible to make an exclusive package or artifact for which an exchange value may be established. In practice the two processes are closely related, with commodified knowledge dependent upon commercialisation.

While several commentators (Stehr, 1994; Callon, 1994) have argued that the market economy has been influencing the commodification of science for many years, the last thirty years has seen science become more of a closed and private activity compared with the largely open and codifiable one which existed previously (Baskaran and Boden, 2007). Baskaran and Boden (2004) argue that this shift in the nature of science towards a market economy has contributed to the reconstitution and subsequent damage of the social contract between scientists and the public and has led to the loss of trust in science by the public. The issue of declining public trust in both science and government is a major feature of my thesis. Stein (2003), offers a supporting theory for the loss of public confidence in science, in suggesting that secularisation and post-modern scepticism, characteristic of the late 20th century generally, has led to a self-reinforcing dynamic in which scientists increasingly need to explain and justify their activities and conclusions to the public, while the public increasingly regard both the

promotionalism and the content of the scientists' messages as suspect, requiring further explanation and justification. Stein's (2003) proposition complements that of Baskaran and Boden (2007), albeit from a different view, in considering a public perspective on the repositioning of science. This phenomenon may be common to other societies with high levels of industrialisation, where controversial aspects of science are illuminated and a more critical attitude towards science may be adopted (POST, 1995). Elam and Bertilsson (2003) suggest that it is the expansionist nature of science itself that has both increased the scope of innovation process in society and the scale and scope for disagreement, over science, in society.

Research commissioned by the Office of Science and Technology and Wellcome Trust in 2000 also identified the public's concerns over the degree to which government now controls science. The poor handling, in the UK, of controversial science-rooted events, such as bovine-spongiform-encephalitis or mad-cow disease of 1996, the foot and mouth crisis of 2001, and more recently (2005) the public's reactions to genetically-modified food and the use of human stem-cells in scientific research, are fitting examples of a public which is no longer prepared to simply accept scientific 'knowledge' promulgated by scientists and government.

The view that science is in some way owned by government is also contributing to a widening 'democratic deficit' that is additionally seeing a decline in participation (by the public) in political processes (POST, 2001). This recognition, by government, that an issue (over loss of public confidence) exists and that this has been known for a number of years is of significance as, to date, government efforts to arrest or indeed reverse this situation appear to have been largely ineffective. The continued

demonstration, by government, that they both recognise and wish to address this issue is, however, positive in relation to my investigation.

The degree to which the UK government is motivated to win back public support for its increasingly commodified approach towards science is likely to influence any future efforts to create a new social paradigm on which to rebuild public confidence and trust in science and the associated processes of government. The growing prominence of scientific knowledge and its value to the economic competitiveness of the UK does, however, suggest that any *reversal* in the ownership, control or focus of science is unlikely. These forces of change, behind recent and current scientific advancement, point towards the need for government to promote a new and more democratic model of PES. Any new model needs to consider both the concerns and motivations of key stakeholders if it is to be effective in rebuilding public confidence in, and support for, science and the associated processes and governance of science, by government and scientists.

The major stakeholders I have identified so far have been government, scientists and the UK public. Gibbons (1999), importantly identifies that the changing social contract between science and society has several elements, which reflect broader contracts between government and society, industry and society and higher education and society. The contracts and associated relationships between government, industry and higher education are all likely to have changed as a result of the repositioning of science over the last thirty years. While identifying three of the major players, Gibbons fails to identify that other ‘actors’ exist and who also influence the social contract between the public and science, an extended group that importantly includes science centres and

other promoters of PES, such as The British Science Association, The Royal Society, The Wellcome Trust and many others.

Of the partners identified by Gibbons (1999), the changing relationship between the UK's higher education institutions (HEIs) and society is of particular interest to me because of the existence of a long-term funding relationship between UK HEIs and government and the increasing similarity between the work of HEIs and science centres in specifically promoting PES. Many HEIs have strong working relationships with science centres and the shifting emphasis of government funding of the UK's HEIs may provide a salient example of what could await the UK's science centres from a closer and developing funding relationship with government.

2.1.1 The experience of UK higher education institutions

For many years UK academics were largely protected from politico-economic pressures to commercialise and commodify their knowledge by the favourable funding relationship that UK HEIs had with the University Grants Committee (Willmott, 1995). Greater state intervention throughout the 1980s, corresponding changes in management, control and means of funding have led to a greatly-changed HEI sector, increasingly characterised by loss of autonomy and increases in assessment and control systems that have contributed to a progressive commodification of academic outputs. The value paradigm for UK HEIs has shifted from one based on research and teaching to the highest possible standard, to one based on flexibility and entrepreneurship in the development of programmes and use of resources (Willmott, 1995). Paradoxically, this shift in approach is likely to be contributing to the growing closure in costly university chemistry, mathematics and engineering departments (POST, 2007).

While care needs to be taken not to generalise his assertions, as necessarily reflective of the wider UK academic community, Willmott (1995) talks about increasing loss of autonomy as an academic in such a way as to suggest that rather than a positive force, driven by commercial imperative, the changes in scientific research being driven by government intervention and funding policy is a negative force to be resisted, albeit recognising that the ability to resist is waning with the loss in autonomy. Thirteen years on from Willmott's (1995) expression of these views, the likelihood of UK central government's funding regime for UK HEIs, and the systems and management processes that this regime has fuelled, changing, seems scarce.

Willmott's (1995) observations, while not conclusive, do point towards several potential realities which science centres could expect from a closer funding relationship with government. Perhaps highest on the list is the loss of autonomy that will ensue as a result of a control agenda that demands further regulation in demonstrating clear accountability through the pursuit of greater economy, efficiency and effectiveness and greater government intervention with regard to strategic direction setting, including a potential push for greater commodification of science centre outputs. Other issues relate to the potential growing influence of political agendas on venues which have historically been viewed as politically-neutral public spaces for science communication and PES and a potential shift in public attitudes towards science centres emerging from a closer association with government.

The experience of UK HEIs, which are arguably more financially-resilient than most science centres, offers a cautionary tale in highlighting that a closer funding relationship between science centres and government could lead to consequences outwith science

centre's direct control. The ability of the SSCN members to negotiate its terms of engagement with the Government are likely to wane with time and could have long-term consequences for the relationship which centres currently enjoy with their visiting public.

While little research is available on how the shift in government policy has affected public attitudes and trust towards HEIs, there is very clear evidence to show that student numbers in certain STEM subjects in UK schools and HEIs is in decline (POST, 2007). Despite growing general participation in higher education, the number of physics, maths and biology graduates remained stable in the ten years between 1994/95 and 2004/05, while the number of chemistry graduates dropped by 35% (POST, 2007).

Clearly factors, other than those linked with government, exist in relation to the downturn in undergraduate numbers taking STEM subjects at university, including early years experiences of science in primary and secondary education, shortages of teachers with specialist qualifications in particular sciences, the image of science and scientists, perceptions of science as a harder subject and poor careers advice (POST, 1995; 2007). All play a part in shaping early, teenage, undergraduate and parental attitudes towards science. While not exhaustive, these factors do demonstrate the magnitude of the task facing those keen to see a reversal in these trends and why a multi-agency approach will be essential if efforts to improve public attitudes towards science are to be successful.

2.2 DEVELOPMENTS IN THE PUBLIC UNDERSTANDING OF SCIENCE MOVEMENT

Having previously considered changes in the nature, governance and ownership of science in the UK and its consequential effect on key relationships, notably that between

government and the UK public, it is also important to consider how government's supporting effort to promote and democratise science have changed, as it is this that has greatest potential to aid redress of the public's growing disenfranchisement with science and notably that linked with government.

The UK field of the social sciences associated with science and society and PUS has advanced considerably since the development of the earliest UK PUS models in the 1980s and the publishing of the Royal Society report, 'The Public Understanding of Science', in 1985. This document, commonly referred to as the 'Bodmer report' after Sir Walter Bodmer, the chairman of the working group that produced it, was commissioned at a time when there was a belief, politically and by many scientists, that the public's interest in and support for science and scientists was in decline. Disappointingly some 22 years after the Bodmer report this was a view still held (POST, 2007). The Bodmer report was also produced at a time when spending on science was under close scrutiny by politicians and having to be increasingly justified in terms of its contribution to national prosperity. The resulting political pressure on science and scientists made them more accountable to the public, with the associated policy measures and funding priorities that followed providing early signposts of the shift in science by government away from its traditional values towards the new, commodified, domain I described in section 2.1.

While questions around how the public might be better informed and engaged with a science agenda remain, the Bodmer report did spark a significant expansion in interest in PUS as a field of research and is credited with having influenced a number of bodies and activities, collectively now referred to as the Public Understanding of Science

Movement. Through these efforts Bodmer also importantly contributed to the shift by those able to influence policy away from a top-down approach to securing advocacy for science to one more concerned, if not necessarily more effective, with uptake and engagement with science by the public.

The answer over how to better measure the effectiveness of public engagement activities will, in part, be addressed by my investigation. In efforts to do so, the concerns raised by some (Irwin, 2001; Elam & Bertilsson, 2003) about the motives of those who have designed past PUS public consultation and discussion forums, in servicing their own needs, is noteworthy. If efforts to realise greater democracy over POS is to be realised the public has to be the starting point in any future discussions generated by government and not the end point.

A further consequence of the Bodmer report was the establishment of the Committee for Public Understanding of Science (COPUS). While now defunct, the major aims of COPUS were to improve public attitudes towards science and to enhance the ‘scientific-literacy’ of the UK public. It was hoped that this would lead to a society that looked more favourably towards science and scientific research. The COPUS approach was grounded in the belief that greater levels of knowledge and understanding for a ‘scientifically-deficient’ UK public would lead to this positive shift in attitudes. This ‘deficit’ view of public understanding favoured by COPUS, contributed to what has become known as the ‘deficit model’ of public understanding and adopted a top-down, one-way approach to communicating or ‘teaching science’ that sought to gain public support by filling the knowledge gap in society with a controlled flow of scientific facts and methods (Irwin, 2001). Wilsdon (2005) considers this early, deficit-based, approach

to PUS as based on a flawed understanding of science, a flawed understanding of the public and a flawed understanding of understanding!

While scientists have been able to identify what amounts to a deficit in PUS, subsequent research (Miller, 2001) revealed that years of COPUS activity had had little effect in addressing the public's doubts and fears about scientific progress. This may be partly explained by the findings of Evans and Durant (1995) who have observed that while a well-informed public is more predisposed to being supportive of science generally it is likely to be less supportive and less trustful of science associated with morally contentious scientific research. This lends further credence to the idea that a better informed public may not necessarily be one that is more supportive of all forms, or indeed any form, of scientific research. This is a key point in highlighting that, while scientific literacy seems a clear determinant of public attitudes towards science, it is not the only one.

In spite of pockets of support for the deficit model of PUS, it has come under sustained criticism from those seeking to identify other knowledge domains and more robust methodologies for what informs and shapes public understanding and public attitudes towards science. Sturgis and Allum (2004) identified that culture, economic factors, social and political values, trust, risk perception, and worldviews are important in shaping the public's attitude towards science but do not discount the additional and independent effect that scientific knowledge has on public attitudes. These comments do potentially support the observations of Evans and Durant (1995) albeit the latter do not describe the wider context of the 'well-informed' and less well informed participants in their study.

This notion of different knowledge domains having influence on public attitudes and understanding of science is supported by Wynne (1992) who suggests three elements of public understanding have to be expressly related in determining lay attitudes towards scientific research: the formal content of scientific knowledge; the methods and processes of science; and its forms of institutional embedding, patronage, organisation and control. While the deficit model does consider Wynne's first two elements it fails to recognise the role that different forms of engagement and context, as described by Wynne (1992) and Sturgis and Allum (2004), have on individuals in shaping lay attitudes towards science. This support for a 'contextualising' of scientific knowledge by at least one other knowledge domain has given way to what has become known as the 'contextualist-perspective' towards PUS, a model that importantly recognises that there is more than one 'public' and a growing awareness that a different and more participative form of pedagogy to earlier models is required if future efforts to promote scientific-literacy, engagement and ownership are to be more effective.

The shift in support towards the contextual approach to science communication has also seen growing favour (by government) for greater dialogue and engagement with the public and a move towards efforts to construct a new "scientific citizen" as described by Irwin (2001), one capable of effectively contributing to scientific debate around contemporary science-based issues. While the widespread existence of scientific citizens is still arguably some way off, the process of creating a closer identity between PUS and processes of deliberative democracy has gradually led to the term PES being favoured over PUS. Rather than a rejection of PUS, PES is viewed as an adaptation of the underlying democratic processes (Elam & Bertilsson, 2003) and it is encouraging that government papers now freely talk about the need to better engage, inform, consult

and involve the public in science-related policy, an important development for supporting NGOs, such as science centres.

2.2.1 UK government interest in promoting PES

The Bodmer report gave early highlight to the UK government's interest in science and further linked it irrevocably with the social and economic agenda I highlighted at the outset of this and my opening chapter. It did however stop short of recording the specific motivations of government in changing the nature of science and wholly failed to highlight the impact that such a change would have on a public trust, that had already been recognised as fragile.

Since the Bodmer report, many UK government initiatives have sought to promote science and encourage public dialogue over science-related issues, with PUS becoming a plank of UK government policy in the 1993 White Paper, *Realising Our Potential* (DTI, 1993). The importance of PUS, and now PES, has been recognised in a number of Parliamentary inquiries, including those by the House of Lords Select Committee for Science and Technology (2000), which recommended that dialogue with the public should become a “normal and integral” part of science-based policy making and research activities. Tony Blair additionally called for “a robust and engaging dialogue with the public” during a wide-ranging speech on science and technology in May 2002. Blair's comments are also reflected in documents such as The Third Report of the House of Lords Select Committee on Science and Technology (2000) which recognised that while the UK public's interest in science was high, science associated with government or industry was viewed negatively by the public and exhibited as a lack of trust. The Select Committee went as far as to describe the situation as a ‘crisis of

confidence' and highlighted public survey data that identified several strands to this. They identified four key issues. The first was that people now question authority, including scientific authority, an observation supported by their second issue that there remains a culture of governmental and institutional secrecy in the UK, which invites suspicion. This, in turn, is supported by the third issue which identified that some issues currently treated, by decision-makers, as scientific issues in fact involve many other factors besides science - inappropriate framing of the problem and excluding moral, social, ethical and other concerns invites hostility. The fourth issue was that underlying people's attitudes to science are a variety of experiences and values. The convergence of these strands with the observations of others detailed previously demonstrates some agreement over where the key issues around public engagement, or perhaps more accurately 'public-disengagement' with science, lie.

In addition to highlighting major issues, the House of Commons Select Committee report also identified a new mood for dialogue in efforts to improve the relationship between science and society. Principal influences on this dialogue included: COPUS; the Research Councils and Higher Education Funding Councils through which the UK government funds academic research; science museums and science centres; the Internet and special initiatives for women. The inclusion of science centres in this list is of significance to my investigation as is their recognition in other government publications including the 2002, POST, 'Public Dialogue on Science and Technology' and 2006, POST, 'Debating Science'.

The recent emphasis on dialogue with the public, by government, is part of a wider public engagement agenda from government that additionally includes public opinion

research, consultation and participation in government efforts to involve the public in science-related policy decisions and the setting of research priorities (POST, 2006). This narrow definition of PES compares with a broader emphasis towards PES adopted by others, like science centres, in describing wider efforts to raise the awareness of science amongst the public. These differences in interest towards PES demonstrate the presence of a political agenda over a non-political one and provide a further indication for why government activity towards PES has not been more effective in changing public attitudes towards science and those seen as controlling it.

2.2.2 Government's commitment to PES

The crisis of confidence, declining participation in political processes and growing scepticism of the UK public in science, and importantly science associated with government, suggests that government interest in improving PES is well placed. Additional motivation for promoting PES, including aiding political decision making processes, strengthening public policy on science and the setting of research agendas gives further credence to government's efforts to better democratise the role of science in society and its contribution to more effective political processes and decision making.

While seemingly committed to promoting PES, the methods currently employed by government do not go far enough if widespread change in public attitudes and trust towards science is to be achieved. POST (2006) identified four problem areas: that methods of engagement (employed by government) are still not accessible to all sectors of society; that measuring outcomes of public engagement activity is difficult to do and rarely achieved; that policy-related PES is divorced from more widespread dialogue between the public and scientists and lastly that the public would like more of

a say on certain science-related issues but feel that government is unlikely to listen to them. The first of these points reinforces that the UK public, rather than being a homogenous group, is increasingly diverse and that actually different strategies are required if society, generally, is to be better equipped for more effective engagement with a science-based agenda.

Science centres are venues for public engagement that do welcome a diverse audience and this is a fitting part of the chapter in which to consider the nature of contribution that science centres do and might make in supporting government policy and intent towards widening and improving societal PES.

2.2.3 The contribution of science centres

I have previously highlighted that science is communicated to the public in a variety of ways and with varying degrees of success. Some methods, as identified by the Optimising Public Understanding of Science report (2003), appear to demonstrate a degree of transferability beyond geographic boundaries. Science centres are one of a relatively small but important group of such mechanisms that are arguably most effective when considering a local context, to importantly include differences in national identity and culture.

In chapter one I mentioned the 19,503,000 visits received to UK-based SDCs between 2005/2006 (Gammon and Harris, 2006, published in ECSITE-UK, 2008a). While few papers have successfully profiled the constituency of the science centre audience it is very apparent from any visit to a science centre that they are of appeal to a range of ages and backgrounds but are particularly popular with primary and early secondary school-

aged children on organised school visits and during leisure visits with parents and guardians.

In chapter one I highlighted the nature of science centres, with a particular emphasis on the Scottish context. The relative infancy of research on science learning in informal settings means there is a lack of established research base around learning outcomes in science centres that makes any current discussion about their contribution or value with regard science education and PES somewhat anecdotal, albeit from an engagement perspective, with over 19 million UK customers annually they are clearly doing something right. Drawing on a disparate literature comprising field-based research, visitor studies and psychological and anthropological studies of learning a recent (January 2009) report by Bell, Lewenstein, Shouse and Feder does begin to make important headway in charting what visitors to science centres and other venues that promote informal science do cognitively, socially, developmentally and emotionally in these environments. The report notes that there are currently few outcome measures to assess science learning in informal settings and efforts to develop relevant measures have often been controversial.

Given its relative infancy what published literature does exist in relation to science centres is often produced/funded by the membership organisations which represent them or, like this thesis, is written by a senior science centre professional, often its chief executive. This clearly has the potential for introducing bias to any investigation or inquiry. Even when the potential for bias is managed, the informal learning approach adopted by science centres makes evaluation of learning outcomes an inexact science. Johnson (2005) alludes to this in what he describes as the ‘slow-burn’ effect, which

follows a visit to a science centre. Johnson argues that it is often some later situation that provides the ‘wider world’ context within which the learner sees the relevance of the science centre experience. This fits with the contextualist perspective towards PES set out in section 2.2. Beetlestone et al. (1998) supports these observations in suggesting that while those who provide financial support for science centres, like the Scottish Government, increasingly seek evaluation of their programmes and activities, the conclusions generated by such evaluation would not withstand rigorous testing because of the nature of methodology typically employed. In this case Beetlestone et al. (1998) is more concerned with the methods of evaluation employed, which are typically taken from a formal education setting, than with the timing of evaluation, as described by Johnson. Clearly, both are problematic. Both issues suggest that the exact educational value, or impact of science centres remains unknown and that a major flaw in the current research base around science centre evaluation does at least leave something of a question mark over what ‘measurable’ contribution science centres might make against aiding government delivery of its PES agenda.

In summation of his paper ‘Science centres are thriving and going strong!’ (2000), Finnish (Heureka) science centre chief executive and sector leader, Per-Edvin Persson, highlighted the need for science centres to develop a research agenda to enable them to better understand the fundamental process associated with informal learning and the impact of science centre activity on surrounding society. Sadly, some eight years on from Persson’s paper, few science centres have implemented such a research agenda and so remain largely ignorant of the effectiveness of their activities or indeed their wider impact on the communities, which they serve. Based on the escalating need for funding by science centres in the UK, coupled with the growing desire of sponsors to

see measurable impacts in return for their funding, this is a situation that cannot continue. This was alluded to by the Scottish Government's 'something-for-something' expression repeated in the opening sentences of this chapter.

In chapter one I highlighted that ECSITE-UK are now (2008) working to develop a benchmarking scheme for UK science centres as a result of the 2007 review of UK science centre funding by the House of Commons Science and Technology Select Committee. While this scheme will take several years to populate it is hoped that this work will help support future efforts to more clearly demonstrate the impact and value of UK science centres.

The relative absence of consistent and robust evaluation methods to date within the SSCN and science centres further afield has led the Scottish Government to adopt an 'outputs' based approach to its financial support of the SSCN. These outputs are typically grouped around broad and relatively easily-measured indicators, such as visitor numbers, commercial spends, quality assurance standards and delivery against agreed educational programmes. Centres are currently required to report on progress at quarterly intervals. The acceptance of this approach by the Scottish Government must assume that, even in the absence of robust evidence, the Government feels some measure of benefit is being delivered. While acceptable to the Scottish Government, this approach would be inadequate for many potential sponsors of science centres as it fails to adequately demonstrate impact. While historically acceptable to the Scottish Government, the change in administration in Scotland to the SNP at the last (May, 2007) Scottish elections has shifted emphasis towards a more robust and accountable approach to funding.

If accepting there are cogent reservations to current evaluation methods for science centres and that at least one major funder, i.e. the Scottish Government, has adopted an alternative approach to funding and associated reporting demands, what research that does exist consistently, albeit anecdotally, suggests that science centres do have a positive and potentially-significant role to play in promoting and delivering a PES agenda.

In stepping away from their educational role briefly, as venues, science centres have been described by ECSITE-UK (2002) as providing welcoming environments that are distributed nationwide providing neutral meeting places for learners of all stages and ages, equipped with specialist facilities with high-quality equipment and year-round, often out-of-hours, access and supported by skilled staff with educational, technical and multimedia expertise. Collectively these qualities translate into venues that house important resources, special competences and which provide access to a broad and varied audience.

It has previously been highlighted that one of the underlying reasons behind public attitudes towards science is the public's trust in, and identification with, the institutions that control it. When those institutions are seen as overly secretive or insufficiently policed, public confidence suffers (POST, 1995). This suggestion, when coupled with the lack of public trust in government, as identified by the House of Lords Select Committee on Science and Technology (2000), points towards a clear case for government working more closely with public-facing venues, like science centres, that promote PES and which are trusted by the public. While difficult to determine the exact level of public trust in science centres, their typical qualities and their collectively high

visitor levels does at least suggest a high degree of public support. In this regard, even before considering the educational effectiveness of current practice in science centres, there is much sense in governments working with these organisations, if government's efforts to rebuild public trust in science is legitimate.

Returning to the educational effectiveness of science centres, while measurement of learning outcomes continues to prove difficult, the informal learning style employed by science centres is appropriate in fitting with a contextual perspective towards PES. Johnson (2005) describes a number of aspects of the informal learning approach employed by science centres that support their continued use of this alternative pedagogy. These include that the informal learning surroundings encountered in a science centre, in which visitors are encouraged to move around a learning environment that have different stimuli in it, mirrors everyday life more closely than in a formal teaching/learning situation. Johnson (2005) also highlights that the majority of visitors to science centres do so as part of a group (families or pre-arranged groups) and during a visit discuss, debate and consult with each other. The combination of these factors means that visitors to a science centre are enabled to work within a personal context and at their own pace. The ability of visitors to experience a learning environment in which they provide much of the context has led to the science centre-type experience being described as a 'free-choice learning environment' (Falk & Dierking, 2000). The varied nature of science communication to be found in science centres also supports different learning styles and abilities.

While much of the evaluation that has been conducted on science centres has been based on their exhibitions, most now offer a much broader menu of educational

activities including public discussions and debates; public theatre in workshops and presentations; meet the scientist sessions, where the science centre becomes a forum for researchers, and outreach activities to schools and hard-to-reach community groups. Many science centres are also now developing their exhibitions in association with HEIs and other STEM-related organisations and in doing so are promoting a new form of knowledge-transfer that provides exactly the type of wider world context to which Johnson (2005) alludes. These exhibitions also present a very contemporary face of science and support a positive ‘early years’ experience of science. Additionally, science centres make good host venues for temporary exhibitions produced by HEIs, which are often funded by one or more of the UK’s research council’s. Many of these exhibitions would have done well to have employed the input of science centres during early development phases as they typically have a good understanding of the needs of their visitors. In summary, science centres have many positive qualities to offer government in return for funding. Their geographic spread, affinity with the public as venues for public engagement, their informal-learning approach and increasingly contextualised orientation to delivery and content marks their potential, if not their current impact.

The informal-learning approach adopted by science centres, coupled with historically weak evaluation only affords an indication of science centre effectiveness in promoting science education and PES. The available literature points to the need for more robust performance indicators for science centres and ones which receive far greater rigour in terms of measurement and evaluation. The difficulty of measuring learning outcomes in the informal-learning environment points towards an approach to performance management that utilises a combination of indicators that includes both output and outcome measures.

The relationship which UK science centres currently enjoy with a visiting public is a major attraction for greater government involvement. Maintaining the integrity of this relationship should be viewed as critical by both science centre and funding partner in establishing a closer, more collaborative, working relationship. The poor financial health of many science centres is such that they are likely to have to accept an accountability agenda, as experienced by HEIs, and where possible negotiate on terms related to content, control and the specific outputs against which performance will be measured. The current dialogue enjoyed between members of the SSCN and the Scottish Government means that this should be achievable. This approach demonstrates an early and important distinction between the early experience of the SSCN in working with its Government, to that of the UK's HEI sector, and one that could see the SSCN making a far greater contribution to promoting PES than they do currently.

2.3 THE INFLUENCE OF FUNDING AND ACCOUNTABILITY MEASURES/FRAWORKS

The UK central government's investment of public funding in science and in those external NGOs involved in promoting PUS/PES, suggests the presence of robust and auditable accountability mechanisms in efforts to clearly demonstrate economy, efficiency and effectiveness in delivering against agreed performance objectives. Collectively these elements support a control agenda in pushing forward government's interest in PES. This certainly appears to have been the experience of the UK HEI sector.

Caulton (1998) considers that the major investment in SDCs by the MC, at the turn of the millennium, required an early appraisal of their performance in demonstrating VFM against the £1billion total investment. While Caulton's own investigations were

inconclusive in determining this, he did identify several useful broad themes of economy, efficiency, effectiveness, excellence and equity. These headings are likely to be of interest to the Scottish Government (or other funders) in determining the value they receive in return for providing financial support. Caulton's approach was, by design, more quantitative than qualitative but does provide a useful starting point albeit Caulton himself recognised that actual performance comparisons only provide a snapshot - an aid to good judgement rather than a substitute for it.

In addition to the roles of funding body and recipient, the public's perception of accountability and funding of PES and NGOs also has some bearing on the public's trust relationship with science and those engaged in the delivery side of PES. Methods of evaluation are likely to differ between NGOs, depending on who administers them, funder (Scottish Government) or recipient (the science centres, HEIs, etc). The desire to achieve a consensus framework within the SSCN suggests both should be considered. In specific relation to PUS/PES activities, Edwards (Edwards, 2004) makes a cautionary point in suggesting they are rarely evaluated against the aims for which they were funded. This may be linked with the difficulty of measuring learning outcomes, as pointed out previously and flags a potential problem in my efforts to identify a meaningful framework through this investigation.

The issue over whether to measure performance outcomes/impacts or outputs, or a combination of both is an important consideration. The relative absence (in science centres) of robust evaluation methods for learning outcomes suggests a bias, already in existence, towards the more easily-measured performance outputs and a small number of carefully-selected performance outcomes. The relevance of any selected measures

across four science centres of very different size and operating in different markets is also important.

Given their similarity to science centres as popular public and cultural venues, the UK's museums and galleries sector provides an interesting and pertinent backdrop against which to consider how a science centre accountability and performance model might take shape, one that is suitable to both organisation and funding body. Any comparison will likely be strengthened by the presence of either government or local-authority funding in the case of public museums and galleries, as similar rules around accountability are likely to apply. That Scottish museums in particular have been subject to so much evaluation, notably as a result of action taken by the Scottish Museums Council (SMC), the strategic agency for non-national museums in Scotland, is doubly useful.

In her 2002 paper, 'Leadership in Museums: Are our Core Values Shifting?', SMC Director, Jane Ryder (Ryder, 2002) highlights two main issues for non-departmental public bodies in relation to external governance and government funding. The first she describes as the arms-length principle in which functions which are not appropriate for government itself to deliver are handed to others, e.g. National Museums of Scotland, to do so "at arms length", with some degree of autonomy in operational and policy matters. The second is the tendency by government to increase central government direction and intervention in management decisions in these situations, something that is clearly at odds with the arms length principle. These conflicting approaches further suggest the likelihood of greater control being exacted on science centres by

government in return for funding, albeit this is unlikely to be externally/publicly exhibited as such.

Ryder (2002) identifies a need for greater accountability for public expenditure and for a shift in its focus away from an examination of process to one of results and a demonstration of impact and effectiveness. This balance seems a sensible one for adoption by science centres in continuing to afford each of them a level of autonomy in meeting their legal requirements as separate legal and charitable entities. In broader UK terms, the opening sentence of former Secretary of State for Culture, Media and Sport, Chris Smith's foreword in the Department for Culture, Media and Sport's (DCMS) report 'Efficiency and Effectiveness of Government-Sponsored Museums and Galleries' (1999, p.5) also resonates:

We are committed to the delivery of quality and excellence in what we do as a Department and in the services provided by sponsored bodies, to greater accountability and to the achievement of best value. Quality and excellence demand efficient and effective delivery and high and consistent standards of performance. To achieve this we need an agreed basis against which to measure performance, to define what we are measuring and how we measure it and models of good practice to help deliver measurable improvements.

Smith goes on to highlight the importance of being able to measure performance of government-sponsored museums and galleries against achieving government objectives, to demonstrate what they achieve with the money they receive, something which the PUS/PES literature rarely refers to in direct terms.

The DCMS report includes development of a new business model with over 300 associated PIs, based around outputs and outcomes and associated measures of efficiency and effectiveness for the museums and galleries sector. From these PIs the

DCMS identified a short-list to act as a foundation for a performance management regime across their National Museums and Galleries (NMG). A review of these PIs is likely to highlight a number which could readily be adopted by the science centre sector. The report also, importantly, recognises a number of threats to the adoption and effective implementation of selected PIs. These include:

- **the diversity of the museum sector.** A product of diverse histories and purpose around a loose theme of advancing knowledge;
- **the power of PIs to influence behaviour.** While intended to influence behaviour in a positive direction, performance measurement can also distort behaviour in ways that have unintended consequences. The report recommends adopting a balanced-scorecard³¹ approach to selecting a range of PIs, which intentionally pull in different directions;
- **the risk that indicators may not measure anything.** Indicators should be meaningful and consequential measures of performance and not just selected for convenience or ease of measurement;
- **comparability and consistency.** If intended to evaluate more than one organisation there needs to be comparability between institutions and between how PIs are defined and collected. Interpretation of data should be used to prompt further questioning rather than simply accept the results;
- **the cost / benefit of collecting PIs.** Benefits of collecting and analysing PIs should outweigh the costs;
- **the number of PIs to collect.** A balance should be struck between the number, manageability, ease and quality of PIs selected.

Lastly, in relation to the above approach, DCMS recommend that consideration be given to how priorities change over time. DCMS suggest a mix of a few core areas, whose indicators will be collected on a consistent basis over time, and others associated with VFM and current government policy which are subject to change. This approach

¹ The balanced scorecard is a strategic planning and management system that is used extensively in business and industry, government, and nonprofit organisations worldwide to align business activities to the vision and strategy of the organisation, improve internal and external communications, and monitor organisation performance against strategic goals
[<http://www.balancedscorecard.org/BSCResources/AbouttheBalancedScorecard/tabid/55/Default.aspx>].

also assumes periodic review. Recognising both the opportunities and threats afforded by establishing a consensus framework, as DCMS has done, will be essential if any science centre performance framework is to be widely agreed and adopted.

A similar study to that documented in the DCMS report was commissioned by the SMC in 2002 and led to the publication of *The Collective Insight, A National Audit*. This and earlier SMC reports such as *Best Value for Museums: A Corporate Approach* (1998), which identified a lack of formal performance indicators for museums, contributed to SMC commissioning Jura Consultants (2003), in efforts to provide a clear picture of standards and performance management schemes in use in UK museums. It was hoped that this might provide a platform for future development by SMC and others. Most noteworthy about the approach adopted, when compared with the DCMS process, was the relative lack of interest in accountability and efficiency measures in favour of quality assurance standards. Jura adopted to review a series of very wide performance ‘standards’ that could arguably be applied to any industry, e.g. Investors in People, ISO9000, Charter Mark. As a result of the broad-brush approach adopted by Jura their findings provided little new insight to my own investigation. What is noteworthy from the Jura study is its use of a matrix in mapping performance standards and schemes and associated tools in efforts to identify areas of overlap, as well as any gaps in provision. The use of methodology does have potential in efforts to identify a suitable mix of PIs for use by the SSCN.

2.4 TOWARDS A SHARED PERFORMANCE AND ACCOUNTABILITY MODEL

While not without its difficulties, clear scope existed for creating a shared performance model for the SSCN, one which meets the needs of the four centres and their primary

funder, the Scottish Government. In addition to the need to better capture and highlight the effectiveness of science centre activities in engaging the public with a science agenda, no small task in its own, there is also a growing appetite amongst funders, for recipient organisations to be able to demonstrate sound financial management and VFM.

Several factors proved essential in advancing development of a performance and accountability framework for the SSCN including maintaining an open dialogue with SSCN representatives – even if this sometimes led to conflict or disagreement, striking the correct balance between governance and impact related indicators and selecting PIs for which ease and consistency of collection and associated reporting across member centres was possible. Key issues, such as differences in the scale, audience and stage in development of centres posed a number of early threats to my efforts to realise a single, consensus-based, performance framework.

While output-based PIs are likely to be found in many science centres, and are employed widely by national museums and galleries across the UK, impact or outcome based PIs, that illustrate the delivery of science centres against government targets on public engagement, democratising science and improving public attitudes towards science, are less well-defined. In this regard precise measurement of the impact of science centres against delivering government policy on PES is, at least in the short-term, likely to remain largely anecdotal.

2.5 SUMMARY

In chapter two I have highlighted the motivation of the UK government in changing the domain of science from an organic one to one increasingly influenced by a marketised

economy and a commodifying agenda. This change has brought with it a growing public unease in the processes of scientific advancement and those most closely associated with it. The resulting loss in public confidence with science, and the organisations seen as controlling it, has previously been recognised, by government, as being at crisis point. To this end recent government efforts have been focussed on addressing this, albeit with little evidence of success. This is likely, at least in part, to be attributable to the methods employed by government and others.

Past emphasis on a deficit approach to public understanding have largely been classed as outmoded, in favour of a more contextualised approach, which encourages public debate and participation.

In its efforts to effect a positive change in public attitudes towards science the UK government appears committed to working with a number of other organisations that share this agenda. The influence of government intervention and funding on these partnering organisations has not always been viewed as a positive one and has arguably weakened the relationship several of these NGOs have historically enjoyed with the public. The potential for science centres to make a meaningful contribution to this agenda has been well publicised, albeit largely anecdotal. The need for funding by science centres, coupled with the desire of government to win back public support for science, lends itself to the development of a performance framework which delivers for both, while also demonstrating a shared accountability agenda.

The literature importantly identified both appetite and scope for developing a performance and accountability model for science centres that has the potential to optimise their performance in return for a continuing funding relationship. Based on the

UK focus of much of the literature the potential for developing a consensus-based performance model or framework appeared to hold similarly true for SSCN members as it did for science centres in England, Northern Ireland and Wales. The existence of a number of well-tested, output-based, PIs in other organisations in receipt of public funding was a helpful starter. Other indicators, associated with educational outcomes and impacts, are less prevalent due to the difficulty in collecting and effectively evaluating them. During the research phase of my investigation I identify a small number, through considering good practice elsewhere.

The differing nature of Scotland's science centres added to the difficulty of attempting to identify a consensus model and highlighted an important need for me to closely involve all major stakeholders throughout the development process.

Gaps in the literature, notably around the exact nature of contribution that science centres make in promoting PES, heavily influenced my choice of methodology and its application during the field research phase of my investigation. The need to draw on the experiences of others was clear if any attempt to develop a wider understanding of the effectiveness of science centres in advancing a PES agenda was to be a legitimate one. In this regard my choice and use of research methods, detailed in chapter three, proved key in fully addressing my research aims and objectives.

CHAPTER THREE

RESEARCH APPROACH

3.0	INTRODUCTION	3-2
3.1	CONSIDERATION OF DATA NEEDED	3-3
3.2	PHILOSOPHY	3-4
	3.2.1 Pragmatism	3-4
3.3	RESEARCH DESIGN	3-4
	3.3.1 Action-Research	3-5
	3.3.2 Participant observation	3-7
3.4	RESEARCH METHODS	3-8
	3.4.1 Building and utilising an international knowledge-community	3-10
	3.4.1.1 <i>Sampling method</i>	3-11
	3.4.1.2 <i>Validity/reliability of research</i>	3-13
	3.4.1.3 <i>Interviews/semi-structured questionnaires</i>	3-13
	3.4.1.4 <i>Analysis</i>	3-15
	3.4.2 Scotland's stakeholders – building consensus	3-16
3.5	SUMMARY	3-16

CHAPTER THREE

RESEARCH APPROACH

3.0 INTRODUCTION

In chapter two, I considered the academic and grey literature in efforts to identify the potential for a PES-based performance management and accountability framework for adoption by the SSCN. While illustrating the changing nature of science and associated changes in the relationship between UK central government and the general public, the literature also importantly highlighted both the scope and appetite for establishing a new, more democratic approach to promoting PES. Science centres have been identified as one of a number of mechanisms that could help support government efforts to achieve this albeit question marks remain over their contribution in advancing such an agenda. This has not been helped by historically weak evaluation of science centre activities and an emphasis on quantitative performance measures that emphasise performance outputs rather than more impact focussed performance outcomes. Where impact orientated evaluation of science centre activities has taken place the methodologies applied, often based on techniques used in more formal education settings, has been questioned.

In chapter three I describe my research approach, the framework I employed in carrying out the research phase of my investigation. I describe my research approach in four parts. In part one I consider the nature and scope of data I needed to collect in advancing my research aim of realising a new performance and accountability framework for the SSCN. In part two, I consider the philosophical perspective, or perhaps more appropriate, practical perspective of my investigation, which informed my choice of

methodology, which I describe in part three. Lastly, in part four, I describe the detail of my choice and use of specific research methods. I consider two distinct phases of fieldwork in initially advancing the establishment of an early performance model and secondly in securing SSCN support for the development and approval of a new performance and accountability framework.

3.1 CONSIDERATION OF DATA NEEDED

The development of my methodology for this investigation was driven by my research aim of developing a new performance and accountability framework for adoption by the SSCN. The specific research objectives I identified in chapter one in efforts to advance my research aim were:

- Identify good practice in relation to performance frameworks, associated performance indicators and their implementation across formal and/or informal networks;
- Consider an emergent model that is appropriate for the Scottish context, making comparisons and drawing out lessons to be learnt from others;
- Share findings of research with major Scottish stakeholders in efforts to achieve a consensus position.

With the clear need to draw heavily from the experiences of others in the science centre field my major challenges around data collection were in working with a large, geographically-dispersed and potentially biased group of contributors. Rather than attempting to overcome the potential for subjectivity based on the perceptions, experiences and interpretations of the members of this knowledge-community I sought to harvest them during my first phase of fieldwork in efforts to inform the second, consensus-building, phase.

3.2 PHILOSOPHY

The practical, problem-solving, nature of advancing my research aim was such that aligning it with a philosophical basis also needed to consider the separate but not independent role of intelligent practice. In this regard the philosophical stance I adopted considers that knowledge, meaning and value are given substance by their practical consequences. On this basis I chose pragmatism as the philosophical basis for my research.

3.2.1 Pragmatism

Pragmatism is a philosophical movement that includes those that claim an ideology or proposition is true if it works satisfactorily, that the meaning of a proposition is held in the practical consequences of accepting it (McDermid, 2006). That pragmatism gets its name from the Greek word *pragma*, which means ‘action’ is in this regard perhaps unsurprising. The need to develop a performance framework, the success of which will ultimately be determined through its implementation, makes pragmatism a close fit for my investigation.

3.3 RESEARCH DESIGN

Defining my research aim in chapter one was an important step in shaping the requirements of my research design. The basis of my investigation, with its emphasis on working with others in efforts to explore, identify and construct a unified performance model, supported the need for me to utilise a qualitative research framework.

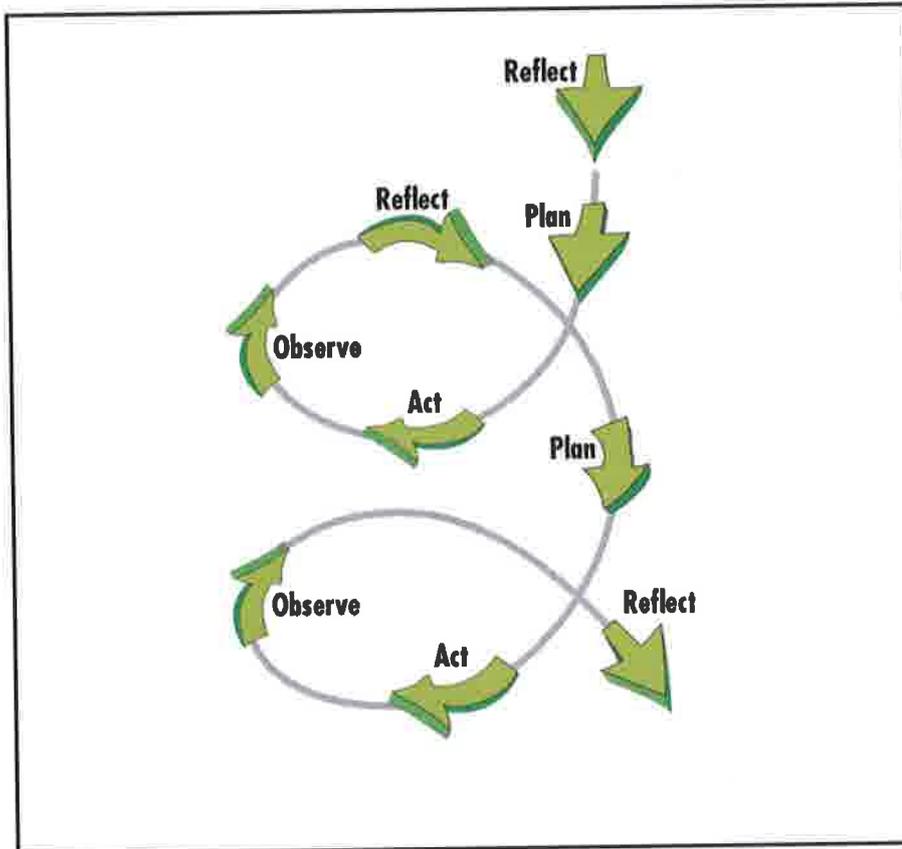
The nature of my investigation, with its cyclical approach to having one phase of data collection inform the next gives credence to my decision to adopt action-research as the basis for my research design.

3.3.1 Action-Research

Coghlan and Brannick (2005) define action-research as an approach to research which is based on a collaborative problem-solving relationship between researcher and client which aims at both solving a problem and generating new knowledge. Its emphasis on resolving important social or organisational issues with those who experience these issues directly links with the operational objective around which my research aim is based. Tenets that define the action-research process include: research in action, rather than research about action; a collaborative (participative) democratic partnership; concurrent with action; a sequence of events and an approach to problem-solving; reflective in considering process and outcomes.

Much of the early work in developing action-research was conducted by Kurt Lewin. Lewin (1946) developed a collaborative, cyclical, process of diagnosing a change situation or problem, planning, gathering data, taking action and then evaluating the results of that action in order to plan and take further action. With the addition of an initial pre-step to describe the context and purpose this cyclical process of research directed at problem-solving has become known as the action-research-cycle (see figure 3.1).

Figure 3.1 Action-Research Cycle



(illustration from <http://celt.ust.hk/ideas/ar/intro.htm>)

Having diagnosed the need for change at the outset of my thesis I followed this with an extensive review of the associated literature. This early process informed the content of my first of two rounds of telephone interviews and afforded me the opportunity to begin bridging some of the gaps left by the literature. Gathering a significant amount of data through this first series of interviews informed and subsequently shaped my second round of interviews. This in turn informed my initial meeting with SSCN participants and paved the way to the development of an early performance model. The opportunity to share and discuss this early model with SSCN representatives led to its further development over the course of two final face-to-face meetings.

Action-research proved responsive in responding to the emerging needs of my research process as it progressed and emergent in that understanding developed through each round of research.

3.3.2 Participant observation

The action-researcher works towards enabling obtrusive change (Coghlan and Brannick, 2005). The possible influence of the outputs of my investigation on future funding allocation by the Scottish Government, including potential for changes in the distribution of funds across individual SSCN members, demanded that I establish clear guidelines for my participation in ensuring legitimacy for the study and the avoidance of claims of dubiety by other key stakeholders involved in my research process. The small ‘core’ group of stakeholders, i.e. the four Scottish science centres and my relevant experience as a science centre chief executive, did however suggest that my involvement as participant-observer would aid the research process.

Balancing adequate subjectivity with adequate objectivity is a challenge of adopting a participant observer role (Marshall, 1998) and particularly as my investigation involved entering the subjective worlds of senior science centre representatives. In essence my challenge has been to draw from the benefits and insights which participant observation affords but not to the extent of rendering the value of my data as questionable. In considering the possible impact of my involvement on the validity of my research process, I adopted a balanced approach in which I used my knowledge of the sector to extend lines of inquiry during interviews and to manage the final participative aspects of my investigation to an eventual conclusion. This approach allowed me to maintain a distance from my study participants in locating their views in a wider theoretical and,

perhaps more importantly, practical context. Striking this balance was to prove even more critical when in August 2007 I was asked by the Scottish Government to lend my personal support to Satrosphere, which found itself facing a financial crisis and almost certain closure. Initially involved in a management capacity for several months I became chief executive of Satrosphere in April 2008 – effectively acting as chief executive for half the SSCN.

3.4 RESEARCH METHODS

My choice of methodology, with its qualitative and participative emphasis, provided clear pointers to the types of evidence and associated research methods that were most appropriate to my investigation.

While I originally anticipated employing a case study approach to my investigation, a method highlighted by Yin (2002) as favouring research strategies that ask ‘how’ questions, the significant number of science centres represented in my investigation, their geographic spread and wider diversity, when coupled with the very targeted nature of my investigation, meant a full case study approach would have proven almost impossible for me to administer. There was, however, sense in utilising several research methods commonly associated with conducting case studies and consistent with my participant-observer status. Yin (2002: 86) describes six sources of evidence for case studies. Table 3.1 highlights these along with the strengths and weaknesses typically associated with their use.

Table 3.1 Sources of evidence for case studies – strengths and weaknesses

Source of Evidence	Strengths	Weaknesses
Documentation	<ul style="list-style-type: none"> • stable – can be reviewed repeatedly; • unobtrusive – not created as a result of the case study; • exact – contains exact names, references, and details of an event; • broad coverage – long span of time, many events and many settings. 	<ul style="list-style-type: none"> • retrievability – can be low; • biased selectivity, if collection is incomplete; • reporting bias reflects (unknown) bias of author; • access – may be deliberately blocked.
Archival Records	<ul style="list-style-type: none"> • [same as above for documentation]; • precise and quantitative. 	<ul style="list-style-type: none"> • [same as above for documentation]; • accessibility due to privacy reasons.
Interviews	<ul style="list-style-type: none"> • targeted – focuses directly on case study topic; • insightful – provides perceived causal inferences. 	<ul style="list-style-type: none"> • bias due to poorly constructed questions; • response bias; • inaccurate due to poor recall; • reflexivity – interviewee gives what interviewer wants to hear.
Direct Observations	<ul style="list-style-type: none"> • reality – covers events in real time; • contextual – covers context of event. 	<ul style="list-style-type: none"> • time consuming; • selectivity – unless broad coverage; • reflexivity – event may proceed differently because it is being observed; • cost – hours needed by human observers.
Participant-Observations	<ul style="list-style-type: none"> • [same as above for direct observations] • insightful into interpersonal behaviour and motives. 	<ul style="list-style-type: none"> • [same as above for direct observations] • bias due to investigator's manipulation of events.
Physical Artefacts	<ul style="list-style-type: none"> • insightful into cultural features; • insightful into technical operations. 	<ul style="list-style-type: none"> • selectivity; • availability.

Adapted from Yin (2002, p.86)

Based on their potential for supporting my data collection needs and sympathy with a participant-observer approach I selected telephone interviews, semi-structured questionnaires, the use of archival and published evidence and collective discussions as my research methods.

My use of extensive archival evidence, collected over the last five years, along with the independent reports commissioned on both the SSCN and the wider UK SDC sector were key to establishing both a wider and more detailed context for my investigation and are covered in chapter four.

I could have employed other research methods in being consistent with a full case study approach but their use would have imposed a significant extra burden on me, notably but not exclusively, in terms of time. This would have considerably lengthened the data gathering phase of my investigation and prevented me from taking advantage of Scottish Government requests of the SSCN in the final stages of my investigation and which were directly linked with advancing my research aim.

3.4.1 Building and utilising an international knowledge-community

While the emphasis of my investigation has been four science centres in Scotland and their joint primary funder, the Scottish Government, there was always sense in drawing on the experiences and knowledge of others in senior positions in the wider science centre community. Had my investigation only involved four centres it would have introduced significant risk of dominant inputs swaying outputs and subsequently influenced the reliability of my research. Assembling and working with an international knowledge-community afforded my investigation several benefits – the group served as a learning resource in allowing me to draw from other experienced practitioners in the

science centre sector who shared similar goals, interests, problems and approaches; developing, capturing, and once assimilated, applying, what good and best practice existed in terms of the use of key performance indicators (KPIs) across my knowledge-community; and, influencing the development outcomes associated with my investigation by promoting a better informed dialogue between SSCN stakeholders during the final stages of my investigation.

3.4.1.1 Sampling method

The key stakeholders within the SSCN membership are the chief executives of the four centres. Their peer group in other science centres in the rest of the UK, Western Europe, North America and Australia formed the basis of my knowledge-community. This was a potentially significant population and I had to rationalise this in efforts to ensure my investigation remained manageable. Three of the four SSCN centres were part-funded by the MC and this supported the inclusion of other UK, MC-funded, centres including LIFE, @t-Bristol, Thinktank and W5. Additionally, Wales and Northern Ireland only have one science centre each and also receive government funding so these were also included. My remaining sample was selected on the basis of its ability to effectively contribute to my investigation.

A sensible starting point in managing my overall sample size was by beginning with the committee members of UK and international science centre trade organisations, such as the European Collaboration for Science Industry and Technology Exhibitions (ECSITE), its UK counterpart ECSITE-UK, the USA-based Association of Science and Technology Centres (ASTC) and the Asia/Pacific Association of Science Centres (ASPAC). Representatives of these organisations are typically appointed by a process of

peer election and based on their experience of operating science centres and wider contribution to the development of the sector. In essence this population of science centre representatives was amongst the most senior and experienced in the field. I additionally employed a snowball sampling technique, achieved by asking initial interview participants to nominate others in senior positions in the science centre sector. Additional participants were selected based on the frequency with which they appeared in the snowball generated list. In total, forty five candidates were identified through this combined process. The full list of interviewees, along with other interview-based administrative data is shown in appendix 1.

I e-mailed an invitation to all potential candidates (see appendix 2). Where candidates did not respond to the initial invite I sent a second, reminder, e-mail. In total 26 candidates (58% of my initial sample size) agreed to participate, only one candidate declined to take part and all others failed to respond in any way. The candidate who declined to participate was a representative of the Scottish Government and who declined on the basis that it was Scottish Government policy not to participate in privately conducted research.

While my invite to potential candidates referred to my anticipated format for candidate participation the final format varied slightly as described under section 3.3.4.4. My first interviews were held between September 2007 and January 2008. Following this first phase of questioning I reduced my sample size to 21 participants (see appendix 3) on the basis of the continuing availability of round one interviewees and the quality of their contribution to my first round interviews. My second round of interviews took place between January and February 2008.

3.4.1.2 Validity/reliability of research

During the data collection phase of my investigation construct validity was facilitated by the use of several sources of evidence which helped me develop converging lines of evidence. The use of a large international knowledge-community of sector experts helped establish external validity in being able to generalise many of my findings beyond the immediacy of my investigation.

My recording of investigative procedures supports the reliability of my investigation in providing an effective audit trail of my research methods that others could follow if desired.

3.4.1.3 Interviews/semi-structured questionnaires

The lack of substantive academic research on science centres and the attitudes and belief systems of those employed in senior positions, in terms of science centres role and effectiveness in widening PES, suggested an early approach to data gathering which provided a broad-base starting point. I achieved this by utilising a semi-structured questionnaire, administered by individual telephone interviews.

My initial questions were informed by my literature review (chapter two) and e-mailed to members of my knowledge-community prior to interviews in the form of a question schedule (see appendix 4). This provided a structure to my interviews and gave interviewees an opportunity to reflect on my questions in advance of the interviews while also affording me the flexibility to move away from my main line of questioning when appropriate to do so.

Conscious of the busy schedules of those taking part I was keen to try and contain each interview to one hour. In efforts to achieve this I tested my initial question schedule with two of my participants. I selected these two candidates based on my knowledge of their own academic backgrounds. In addition to managing the length of interview I was also keen to use the opportunity of testing my questions to secure feedback on their appropriateness. This early testing process proved beneficial in reducing the number of questions from twenty-three to eighteen, eliminating questions that had elements of duplication in them as evidenced by interviewee responses.

I recorded all of my interviews with the consent of my interviewees and additionally took extensive contemporaneous notes. I also advised interviewees that I would give them final approval on any quotes I wished to use from their interviews before submitting my final thesis.

My round one interviews focussed on participants existing relationships with their governments and their knowledge of other funding models and performance frameworks. Prior to commencing every interview I utilised an interview structure (see appendix 5) in efforts to ensure all interviewees received the same information and interview format. I also adopted this approach during my second round interviews. Round two interviews also comprised a core of eighteen questions (see appendix 6) and developed on the first round interviews and a further review of the questions unanswered by my literature review. These focussed on context, mechanism, measurement and evaluation. In both rounds I interviewed participants according to availability - interview schedules are recorded in appendix one and three. My Scottish participants were, however, interviewed at the end of each round of interviews in efforts

to ensure, as interviewer, I was informed of any developing lines of questioning from earlier interviews.

3.4.1.4 Analysis

The new model associated with my investigation emerged out of the analytical phase of my research process.

My general analytical strategy for this study was to follow the theoretical propositions and my subsequent choice of research design and methods. My use of a large knowledge-community, which generated significant data, suggested an approach to analysis which had inductive-reasoning at its core. The specific observations of a large group of individuals allowed me to detect regularities and patterns within the interviewee responses to my questioning using a form of constant comparison. Glaser (1978) describes a six step process to this method of analysis. Step one, simply involves beginning to collect data. In step two Glaser describes looking for key issues, recurrent events, or activities in the data that become categories for focus. Step three, involves collecting data that provides many incidents of the categories of focus with an eye to seeing the diversity of the dimensions under the categories. Step four, write about the categories that you are exploring, attempting to describe and account for all the incidents you have in your data while continually searching for new incidents. Step five, work with the data and emerging model to discover basic social processes and relationships. Finally, engage in sampling, coding and writing as the analysis focuses on the core categories. I addressed steps one through four of Glaser's process through gathering and analysing my interview data. Steps five and six I addressed through my face to face meetings with SSCN stakeholders.

The patterns to have emerged through this process allowed me to develop general conclusions and theories. While not affording great statistical weight to my analysis my approach did fit with the qualitative focus of my overall investigation.

3.4.2 Scotland's stakeholders – building consensus

My final phases of field work employed a focus group approach involving the SSCN members of my knowledge-community in efforts to secure consensus around an emergent performance framework. This aspect of my research was consciously left to the end of my investigation because of the potential for conflict and the introduction of bias. The participants in these final phases included the three SSCN chief executives and the scientific directors of ODE and GSC. Two meetings were held and a full minute of each meeting recorded. The first meeting, on the 26th February 2008 (see appendix 13), provided an early opportunity for sharing the responses of both phases of interviews and my analysis of this data. This meeting also provided a critical forum in which to discuss emerging themes and their fit with the Scottish context. My second and final meeting with the SSCN members took place on the 20th March 2008 (see appendix 15) and moved the group to a near consensus position. The new framework was finalised through e-mail correspondence between the chief executives following the face to face meetings.

3.5 SUMMARY

In chapter three I have set out the research design I employed in carrying out my investigation, its philosophical foundations and the specific methods I used in efforts to best address my research aim. The application of these methods supported my pursuit of credible, robust and reliable results. The use of a large 'knowledge-community' was a

distinct advantage in advancing and developing a performance model for Scotland's four science centres. The inclusion of other UK and international participants also lent scope to developing a model which has value beyond Scotland. This has the potential to assist other UK science centres in their continued efforts to achieve advocacy and government funding, albeit in return for adopting an auditable performance regime.

In chapter four I describe the factors that influenced recent Scottish Government thinking, in terms of its shift in expectations of the SSCN in return for a continued funding relationship. By drawing on a significant range of materials, including archival evidence and the independent reports of consultants I provide further context to the changes which have taken place in Scotland's science centre base and which further demonstrate the need for a new and more meaningful performance and accountability framework. Chapter four additionally draws on the wider UK context for recent and continued change.

CHAPTER FOUR

RECENT PRACTICE IN SCOTLAND

4.0	INTRODUCTION	4-2
4.1	ARCHIVAL EVIDENCE	4-3
	4.1.1 Early discussions	4-4
	4.1.2 A developing relationship and growing expectations	4-8
	4.1.3 A new science champion for Scotland	4-10
4.2	THE CONCEPT OF A NATIONAL SCIENCE CENTRE	4-12
4.3	THE SCOTTISH SCIENCE CENTRES NETWORK 2005-09	4-14
4.4	THE SCOTTISH SCIENCE CENTRES NETWORK AND SCIENCE EDUCATION	4-16
4.5	SCOTLANDS SCIENCE CENTRES – IMPACTS AND FUTURE INTERVENTIONS	4-18
	4.5.1 Cause for concern	4-20
4.6	DEVELOPMENTS WITHIN THE WIDER UK SDC SECTOR	4-21
	4.6.1 The funding of science and discovery centres	4-21
	4.6.2 Inspiration, engagement and learning: The value of science and discovery centres in the UK working towards a benchmarking framework	4-23
	4.6.3 The impact of science and discovery centres: A review of worldwide studies	4-24
4.7	SUMMARY	4-25

CHAPTER FOUR

RECENT PRACTICE IN SCOTLAND

4.0 INTRODUCTION

In chapter three, I presented the philosophical perspective of my research and described the methodology, data collection methods and methods of data analysis I employed in carrying out my investigation. I justified my methodological choices around capturing and building upon the experience and best practice being exhibited by other science centres elsewhere in the UK and internationally.

In chapter four, I more fully describe the context of recent change in the SSCN and through doing so point to current and emerging policy expectations of the Scottish Government in return for a continuing funding relationship with the SSCN centres. This chapter builds considerably on the foundations I laid in chapter one, which provided a brief background to the Scottish science centres, their early discussions with the Scottish Executive and the use of an early and unsustainable funding model, i.e. one of deficit-funding centres.

In fully analysing the recent changes in Scotland, I have organised chapter four into three parts. In part one, I draw upon and analyse a number of sources of archival evidence that helps me chart some of the key communications between SSCN centres, my own centre in Dundee (including Satrosphere from 1st April 2008) and the Scottish Executive/Government over the last five years (2003-2008). Access to these sources of evidence was possible because of my status in this investigation as participant-observer.

My exploration of this significant archival evidence base follows a natural timeline and in doing so charts the development in dialogue between the SSCN and the Scottish Government from its earliest to its most recent. In part two, I consider the reports, typically commissioned by the Scottish Executive/Government, that have been published during the timeline mentioned above. This combined process clearly illustrates how both thinking and expectations have changed between both groups of stakeholders from 2003 to 2008. Finally, in part three, I give some brief consideration to developments in the wider UK context, again drawing on key publications, as these also have bearing on my investigation.

4.1 ARCHIVAL EVIDENCE

The archival evidence associated with the developing relationship between the Scottish Executive/Government, and the four members of the SSCN is rich and extensive. Following a search of my own archives I identified over two hundred pieces of direct communication. This extended back as far as May 2003 and takes several forms but mainly e-mail and written correspondence and takes place between a range of the major stakeholders. These included the chief executives of the SSCN centres, the original (1998 – 2004) chairman of DSC, Professor Ian H. Stevenson, current chairman (2004 – 2008), Professor David Sigsworth, Scottish Executive/Government civil servants, their ministers and the consultants commissioned by the Government.

The nature of this correspondence, typically when e-mailed, is such that much of it expressly states that it is for the use of the individual or entity to which it was addressed. While early correspondence has few limits to disclosure associated with it, more recently there has been far greater attention given to including legal disclaimers which

do not permit unauthorised use, disclosure, storage, copying or onward distribution of any part of the e-mail. This may be a further weakness associated with the use of recent archival records, particularly when electronically based, to those I previously identified by Yin (2002) in Table 3.1 of chapter three. Accepting these limitations to its use, the archival correspondence remains an important source of evidence for my investigation and so has been drawn on in efforts to better describe how the relationship and associated expectations between the Scottish science centres and the Scottish Executive/Government has changed during the last five years.

4.1.1 Early discussions

The earliest correspondence I have between Scottish science centres and the Scottish Executive dates back to May 2003. This letter to the Government, from the chairs of the five science centres' Boards of Directors, which at this time included the still operational TBI, reports on a meeting held in March of that year in which the creation of a network of Scottish science centres was first mooted. The five chairs identified a need to create a new body to replace the earlier Scottish Science Trust. It was suggested that this body should operate at arm's length from Government and recognise the autonomy of the five centres. It was proposed that the new entity should also act as an advocate of the centres with a remit of ensuring that the work of the science centres underpin and contribute to the delivery of the national science agenda; promoting the five centres as valuable national cultural assets under a corporate banner such as 'Science Centres of Scotland'; ensuring their continuity and in doing so, act as a campaigner for the centres in discussions with major funding bodies; and promoting the centres as valuable educational resources.

That this early correspondence recognised an important education role for the science centres but also that they were largely focussed on sustainability issues, is of some significance as at no time since my own arrival in Dundee in October 2001 have I been aware of the Scottish science centres as having been in anything other than a financially vulnerable state of health.

As a direct result of the chairs' meeting in March of 2003, the mandate to continue a dialogue with the Scottish Executive was handed down to the chief executives of the centres, amongst them myself. This work began in earnest in August 2003 with the submission of a briefing document from a group of six science centres that also briefly included the Scottish Sea Bird Centre in North Berwick. The Sea Bird Centre cleverly secured a place at the negotiating table on grounds that it also promoted PES but was dropped from negotiations by the Scottish Executive at an advanced stage of discussions (9th October 2003), seemingly for fear of opening the floodgates to wider SDC venues such as zoos and aquaria. All initial discussions between the science centres and the Scottish Executive took place with the department for Enterprise, Transport and Lifelong Learning.

The centre's briefing document highlighted several major areas - how science centres deliver the government agenda, cost (of delivery), comparison (e.g. VFM), the price of failure and several recommendations with regard remedial action. The briefing document helped secure a meeting with Scottish Executive civil servants that subsequently paved a way for further dialogue. Of note from the early correspondence was the very clear message from the Scottish Executive that funding would come at a

price, with visible change in the way in which centres had operated historically, and closer linkage with Government policy, anticipated.

During these early discussions TBI went into administration (August 2003). This major event gave a heightened urgency to moving negotiations forward or face others experiencing a similar fate. In essence, to provide the remaining four centres with a relatively small amount of annual funding would protect an asset base across the remaining centres worth more than £130m. To keep centres operating would also remove the risk of the Scottish Executive facing the possibility of claw-back of European regional development funds which had been utilised by three of the five science centres during their initial set-up, a significant motivator by itself.

Despite positive early dialogue with civil servants, centres were advised that ministers would not commit to long-term funding of the centres, but were minded to do so, if a workable strategy could be developed to establish a *National Science Centre* body, with the five individual science centres, including a potentially resurrected TBI, as franchises or spokes from this hub. It was proposed that any long-term funding from the Scottish Executive for centres be provided through this intermediary body. Bearing similarities to the earlier idea of the science centre chairs, the Scottish Executive committed to commission an independent study in order to further inform their thinking. Jura Consultants were duly commissioned (2003) with some of their reports findings have already been mentioned in chapter one. I give further consideration to Jura's study, along with its implications for the four centres in section 4.2. Finally appointed in December 2003, Jura undertook a wide-ranging business review of the five Scottish centres. This review focussed on the financial performance and business planning

capabilities of each of the centres and amongst other things determined that TBI was unsalvageable. A review by HMIE (2002) on each of the four centres, its first, was additionally drawn on in terms of their education-related effectiveness.

Following completion and final submission of the Jura study in May 2004 Scottish ministers agreed to make funding available to the four science centres. The announcement of this decision in writing to me is captured in appendix 7. By way of accepting the offer of funding the chairmen of each centre were asked, by the Scottish Executive, to respond using the following specific wording:

This reply is on behalf of the Board of [name of centre]. The Board has read the Jura Consultancy report in relation to the centre and is content that it contains reliable information relating to the existing and expected business performance of the centre. The Board understands that the Scottish Executive, in partnership with Scottish Enterprise, intends to make available adequate grant aid to support the revenue and various urgent capital needs of the centre during 2004-05, as set out in the Jura report, and that firm proposals are in hand to provide similar support in future years. The Board understand the continued need for the centre to work to attract sponsorship from other public and private sponsors, and that ongoing evidence of this effort will need to be provided.

The Board accepts that all funding provision by the Executive will be dependent on adequate progress being made by the centre on the business improvements identified in the Jura report, including greater collaborative working with the other 3 centres, and other science education providers, sharing of exhibition material and development of the centre's involvement with school education, and other specific improvements mentioned in the Jura report. The Board and Management of the centre will work in full co-operation with the Jura Consultancy, The Scottish Executive and other public funders with the aim of implementing these transitional changes with due speed and within timescales to be agreed through further negotiation. I agree that the Scottish Executive can announce the general terms of these plans in the near future.

This requirement of each centre is of interest in its recognition of the predicament of centres but equally in its lack of any clear link with Scottish Executive policy around

either PES or science education. The public announcement over the Scottish Executive's decision to fund the four Scottish centres was made by then Deputy First Minister and Minister for Enterprise, Transport and Lifelong Learning, Jim Wallace, at Dundee Science Centre on 22nd June 2004.

4.1.2 A developing relationship and growing expectations

Beyond the publication of the Jura report (2004a), the subsequent decision of Scottish ministers to provide funding to the four Scottish centres and the conclusion of related negotiations held between individual centres and the Scottish Executive, the work of beginning to develop the SSCN was able to commence.

My archival correspondence highlights the 24th September 2004 as an important date as this was the first recorded meeting under the new funding regime of the four SSCN chief executives and representatives of the Scottish Executive, a group that was collectively given the name the Joint Executive Group (JEG). The minutes of this meeting and those that followed show an early emphasis by the Scottish Executive on trying to establish appropriate mechanisms for both monitoring and measuring the performance of the SSCN centres. This theme was continued at the second meeting of the JEG on the 5th November 2004. In advance of this meeting the Scottish Executive forwarded a paper called *Measuring Success* (see appendix 8), a document that sought to advance development of an early performance framework for the SSCN. The six principal themes of this document were operating as successful and quality visitor centres; communicating science to society; contributing to the science education of pupils and teachers; collaboration across science centres and Science and Society initiatives; sustainable science developments in society and ensuring appropriate

accountability and governance. The Scottish Executive highlighted a series of high level outcomes and objectives under each theme (see appendix 9) and while many, on reflection, demonstrated some advanced thinking by the Government, few were taken forward in terms of further development and subsequent adoption as performance reporting requirements.

Despite a lack of progress in certain areas the development of a SSCN strategy, covering the period 2005-09, was advanced

(<http://www.scotland.gov.uk/Publications/2005/12/06113103/31038> [Accessed 4th April 2007]). While described more fully in section 4.3 *The Scottish Science Centres Network 2005-09*, the archival correspondence highlights that early discussions between the Scottish Executives and centres over a joint strategy started in December 2004. The development of this initial SSCN strategy document was a collaborative one and developed through regular dialogue between the five major stakeholders (the four SSCN centres and the Scottish Executive).

During the development of the SSCN strategy the Scottish Executive implemented a quarterly grant claim process (July 2005). This required each centre to provide quarterly performance reports in order to release revenue funding. Reports (see appendix 10) were expected to record each centre's performance against visitor and financial targets, updates on delivery against commercial and education targets set out in each centre's annual operating or business plan, and the mitigation of any operational risks experienced by the science centres. Reports contained a mix of quantitative and qualitative, output-based, performance-related information. This same reporting

requirement has continued and remains a condition of Scottish Government grant draw down.

The SSCN strategy was eventually launched in December 2005, by then Deputy First Minister and Minister for Enterprise, Transport and Lifelong Learning, Nicol Stephen.

Beyond the launch of the SSCN strategy, the four centres met less frequently and the JEG group has rarely met since. Despite the subsequent reduction in joint-communication, the SSCN strategy did provide a further framework against which to measure performance and importantly from a network rather than an individual science centre perspective. This has proven useful, albeit without annual revisions the document, written in 2004, is now (2008) only loosely relevant and with, in theory, a further six months (from September 2008) to run to the end of March 2009. Despite this, at a joint meeting on the 23rd July 2008, the chairs and chief executives of the SSCN centres collectively agreed to formally conclude the first SSCN strategy in favour of advancing a new, more independent, method of operating for the network, one more focussed on centres building their own regional community networks than on the SSCN. This shift in approach, agreed after the conclusion of my investigation and consensus building phases of research, holds the potential of significant consequences for the future of the SSCN.

4.1.3 A new science champion for Scotland

Having reported to the Department for Enterprise, Transport and Lifelong Learning for two years, the Scottish Executive announced the appointment of a new Chief Scientific Advisor for Scotland, Professor Anne Glover in May 2006. At this time the Government's Science and Society Team, to which the four centres had been reporting,

moved from the Department for Enterprise, Transport and Lifelong Learning to OCSA. On reflection this move brought further political focus to the SSCN and gave it a departmental focus which arguably it did not have when part of the Department for Enterprise, Transport and Lifelong Learning.

Within six months of Professor Glover's appointment two further major studies had been commissioned by the Scottish Executive and conducted by HMIE (2007), the centres' second, and Halcrow Group Limited (2007). In contrast to the HMIE review, which largely focussed on improvements in educational effectiveness, the remit of the Halcrow study was much wider in considering the economic implications of the Scottish Executive's funding for the SSCN, along with scope for future interventions. In this sense the Halcrow study represented a follow-up to the original review of SSCN centres by Jura in 2004. I describe the objectives and outputs of both studies under section 4.4 *Review of the Contribution of the Scottish Science Centres Network to Formal and Informal Science Education* and 4.5 *Scotland's Science Centres – Impacts and Future Interventions*.

Before considering each document it is worth highlighting that, as with the original Jura report (2004a), the outputs of the Halcrow study generated major implications for the SSCN centres, the final consequence of which are still (September 2008) being felt. Key recommendations made by Halcrow were fed into the Scottish Government's comprehensive spending review in 2007 and contributed to the securing of a new round of funding for the SSCN (£7.5m for the science centres over the period 2008-11). This very positive announcement was accompanied by the news of a new mechanism for distributing Scottish Government funds across the SSCN. This would see the first major

shift in funding distribution since funds were first offered to the SSCN in 2004 and would see three (DSC, ODE and Satrosphere) of the four centres receiving an additional funding allocation. These future funding intentions of the Scottish Government are recorded in letters from OCSA to my chairman and me (see appendix 11 and 12) and are considered more fully in chapter seven because of their impact on the early evaluation and development of my emergent SSCN performance framework.

Despite the generally positive nature of the Scottish Government's recent announcements, the rejection of the new distribution mechanism, based on the allocation of funding per visitor, by one of the SSCN members, GSC, led to a further protraction of dialogue with the Scottish Government. GSC refused to accept the new mechanism on grounds that it would see the centre, the largest in Scotland, receiving a significantly lower level of funding than it had in previous years.

At September 2008 the Scottish Government had offered further qualification to the basis of its change in funding approach and offered formal grant offer letters to all of the SSCN centres. The significance of this recent situation on my investigation is such that I will revisit it in chapters seven and eight.

4.2 THE CONCEPT OF A NATIONAL SCIENCE CENTRE

In returning to the chronological order of the reviews of the SSCN the development and subsequent support for Jura's report by Scottish ministers has already been described (see section 1.3.1 of chapter one). The title of Jura's study (2004a), *Development of the Concept for a National Science Centre*, is somewhat misleading but was in part commissioned to consider the scope for creating an overarching organisation, at arm's length to Government, to which the science centres would report and through which

Government funding would flow to centres. Through their investigation Jura established that creation of a National Science Centre would deliver minimum efficiency savings and lead to poorer performance from the four centres if ‘merged’. Additionally, having been both personally and organisationally involved in this dialogue, it was also very evident at the time that few, if indeed any of the four, centres, specifically their Board’s of Directors, were willing to relinquish all, or indeed any, control and effectively their independence in return for a funding relationship. All, however, were willing to engage with an agenda in part related to advancing collaborative working.

In addition to paving the way for a funding relationship between the four centres and Scottish Executive, the Jura study also identified a series of performance improvements that each centre should work towards delivering. These varied considerably between centres and typically included transitional elements and longer-term objectives. The concluding remarks of Jura’s *Summary Report* (2004b, p.18) for my own centre stated:

The key issues for the science centre lies in its long-term operation. While some science centres are able to survive on a very short-term basis the requirement for continual reinvestment in exhibits, additional marketing and an inability to meet running costs means that long-term sustainability at this time is not a realistic proposition. Without additional capital funding and revenue funding the centre will continue to see visitor numbers fall and see the gap between income and expenditure widen.

However, the centre does provide a significant resource for the education sectors in a specialist area and as such there is a recognition that this service should be secured in the longer-term. Nevertheless to fully serve the local price sensitive education market these is a need to provide a quality service at an affordable price, which the centre will be unable to do without further public support and reinvestment in exhibits. In conclusion Sensation (Dundee Science Centre) must strive to improve business performance through efficiency, economy and effectiveness.

Anecdotally, having seen the summary report of at least one other centre, that read the same word-for-word with just the centre name changed, there seems to have been a common message sent out to centres. That having been said, the specific improvements identified by Jura were funded by the Scottish Executive and made a very significant difference at the time.

4.3 THE SCOTTISH SCIENCE CENTRES NETWORK 2005-09

As per the Jura report I have previously touched on the content, promotion and influence of the SSCN strategy. As an early strategic framework this document clearly illustrated the Scottish Executive's aspiration for the network and importantly came with ministerial approval. Few others in the UK, including the science centres that receive government funding in Wales and Northern Ireland, are likely to have received such strong political endorsement.

While recognising the dual role of the science centres as popular visitor attractions and educational venues, the SSCN strategy was primarily interested in improving engagement between major stakeholders, including the centres themselves, industry, the education sector (both formal and informal) and the wider UK public.

Refreshingly, through the SSCN strategy, the Scottish Executive demonstrated their recognition of the need for a new approach towards promoting PES in moving away from a traditional 'top-down' and controlled flow of information to the public, towards one more focussed on engagement and dialogue on science and the issues it raises for individuals and society. The Scottish Executive's approach publicised its commitment to creating greater public involvement in the debate about the place of science in society, something which it importantly continues to do.

The Scottish Executive expressed two key areas of interest through the SSCN strategy. The first, was around the SSCN centres supporting Government direction in return for public funding and secondly the pursuit of greater collaboration between SSCN centres and other initiatives around the themes of partnership working, commercial operations and network education awareness-raising. The SSCN strategy laid out clear policy recommendations and key deliverable outputs against each area and while too extensive to cover here did collectively demonstrate the Scottish Executive's belief that by working together, and with other relevant organisations, the four SSCN centres had the potential to make a difference in growing the Scottish economy, closing the opportunity gap and demonstrating Scotland's pro-science outlook.

One of the short-term challenges of the SSCN is in how the SSCN centres demonstrate they have delivered against the SSCN strategy. As I highlighted in section 4.1.2 the strategy was signed-off by the chairs and chief executives of the four science centres at its meeting in late July 2008. While not explicitly stated as such, the SSCN strategy had many performance objectives identified within it. In addition to supporting Government direction and greater collaboration, other recorded areas of policy interest and delivery included the science curriculum 3-18 based; links with Further and Higher Education; links with industry; and encouraging science as a career choice. The strategy also highlighted a number of additional strategic milestones set against each year of the strategy. Collectively forming a performance framework in its own right, with a mix of outcome and output based objectives, there should be real concern, within the SSCN members over the extent to which these have been delivered and can be evidenced. As participant-observer, my own concern is that while a number of the output based objectives were met, many more of the deliverables expressly desired by the Scottish

Executive were not substantially advanced and where progress was made this has been difficult to objectively demonstrate/evidence. This is as clear a signal as any that a new approach to performance management and reporting is required if the SSCN is to more clearly demonstrate both its potential, and perhaps more importantly at this stage in its funding relationship with government, its effectiveness.

4.4 THE SCOTTISH SCIENCE CENTRES NETWORK AND SCIENCE EDUCATION

As a function of measuring education-related performance against the objectives highlighted within the SSCN strategy, HMIE Inspectors carried out their second review of the SSCN centres between September and November 2006. The dual purpose of this second examination of the centres was also to chart their progress since HMIE's first inspection of the four centres in 2002. This earlier review of centres was a function of a UK-wide review of science centres and led by the Department of Trade and Industry. This found that the contribution of the science centres to formal science learning was greatly valued by schools, especially primary schools and complemented and enriched, rather than duplicated, pupil's school science learning at both primary and secondary levels. The review pointed to strengths and areas for development in each of the centres.

The 2006 HMIE inspection focussed on five major areas. First, as previously mentioned, progress made by the four centres since its original review in 2002. Second, improvements in the quality and range of educational resources (including activities, exhibits and facilities) available across the centres. Third, the quality of existing education and outreach services provided by the centres. Fourth, the presence of strategic links between centres, the academic community and local businesses and lastly, relevant commentary on commercial, staffing and/or marketing issues.

Importantly the HMIE inspections did identify improvement in all centres against the earlier review including in accommodation and resources, the skills of staff in both communicating with and enthusing young people and adults about science, links with schools and cross-centre collaboration. In addition to these improvements the HMIE inspectors expressed a desire to see centres continue to work cooperatively with other agencies in efforts to provide more high-quality development for teachers. The inspectors also highlighted the potential of the science centres for showcasing local research and developments in higher education and industry. The inspectors also identified a range of individual strengths and development areas in centres under the headings resources, programmes and activities, ethos, quality assurance and learning and teaching. Despite there only being four centres the range of strengths and weaknesses identified by inspectors effectively provided a ranking of the four centres.

Following the launch of the HMIE's report in March 2007

(<http://www.hmie.gov.uk/documents/publication/sscn.html> [Accessed 24th January 2008]) the Scottish Executive encouraged each of the SSCN centres to bid for funds in order to address the specific development areas identified by HMIE. Many of the successful proposals are still (September 2008) being implemented and will see significant progress having been made across the SSCN by the time of the next HMIE inspection in June 2009.

The recognition by HMIE that the SSCN centres have an important role to play in complementing and supporting science education in schools, colleges and universities and more widely through raising the profile of science across the nation and by enthusing those in local and broader communities is of major significance. That HMIE

encouraged the Scottish Executive to continue to support the SSCN so that centres might make even greater contribution to the social and economic prosperity of Scotland and at a critical point in the Government's last comprehensive spending review is also highly encouraging.

4.5 SCOTLAND'S SCIENCE CENTRES – IMPACTS AND FUTURE INTERVENTIONS

In September 2006, at the same time as the HMIE inspectors started their second review of the SSCN, the Scottish Executive appointed Halcrow Group Limited to undertake a study of the four SSCN centres in efforts to inform future policy, delivery and future commitments to the SSCN. As a function of this work Halcrow consulted with a wide range of SSCN stakeholders, including visitors, and supplemented this activity with extensive desk-based research. One of the main objectives of this study, as identified by Halcrow in their report (2007, p.2;

<http://www.scotland.gov.uk/Publications/2007/11/02154710/3> [Accessed 11th

September 2008]) was:

the development of a set of performance objectives, and it is recommended that these should be used to measure the future performance of the science centres. The two key performance objectives focus on increasing the number of visitors from all ages and backgrounds in Scotland and are supplemented by a set of six objectives, with a focus on quality and collaboration. This review concludes that an outcome based approach to funding be adopted by the Scottish Executive. It is also recommended that the share of funding for each science centre should be directly linked to performance against the key performance objectives.

The six sub-objectives, focussing on quality assurance, integration with the 3-18 curriculum and promoting coordination with other agencies were identified as:

- 1) To maintain average customer satisfaction at no less than 8 out of 10 for all visits;
- 2) To achieve and maintain at least a four star rating from VisitScotland by 2009;
- 3) To ensure that all of the recommendations arising from the 2006 HMIE inspection are implemented by 2009;
- 4) To ensure that all science communication activities delivered by the SSCN are subject to an established quality standard by 2009;
- 5) To provide clear linkages with the learning outcomes arising from the 3-18 Curriculum for all visits by Scottish children to the SSCN;
- 6) To ensure all outreach activity is effectively co-ordinated with other science engagement partner organisations.

Halcrow also investigated a range of other possible policy interventions including free admission for different visitor categories, half-price admission and free transport for visiting school groups. Much of this research was based on the experience of major UK institutions, such as the Museum of Science and Industry in Manchester (MOSI) and the group of national museums that collectively forms the National Museum of Science and Industry (NMSI). The major scale of both groups of museums, coupled with their locations in some of the UK's major cities means that any attempt to correlate their experience in terms of what this would mean for Scotland was, at best, ambitious. That this had not been fully thought through was evidenced by the fact that Value Added Tax implications for the three new centres (DSC, GSC and ODE), linked with how they were initially set up, meant that any offer of free admissions (with the Scottish Executive agreeing to offset this cost) would come with a multi-million pound price tag. This option was quickly eliminated.

Of greatest importance to my investigation is Halcrow's recognition that the existing funding mechanism employed by the Scottish Executive, to deficit-fund centres, was inadequate and provided little incentive in supporting those that performed less well financially. In its place Halcrow recommended the Scottish Executive adopt an outcome based approach and that the formula used be straightforward and transparent and that the revenue funding of the four centres reflect key objectives and each science centre's share of total visitor numbers. This specific recommendation is of major significance to my investigation as it provided further weight to the need to shift the emphasis of future Scottish Government funding to the SSCN away from one based on *need* to one based on performance. Halcrow's recommendation and its early adoption by the Scottish Government led to the dispute highlighted in section 4.1.3 *A New Science Champion for Scotland*, a situation that has only recently (July 2008) been concluded.

4.5.1 Cause for concern

Drawing on my participant-observer role I can highlight that the Halcrow study, their first on science centres, was not conducted and subsequently released as perhaps it should. Despite Halcrow's reporting that extensive consultation with centres took place this was quite simply not the case. In my own instance a single meeting was held between the consultant and my chair Professor David Sigsworth and me. Following this meeting there was no follow up from Halcrow for several months and when this did come it was as an offer to attend a presentation of the final report with the other SSCN chief executives and chairs. All centres expressed their disappointment to the Scottish Executive that they had not been allowed to review and return comments on a draft report and so what ultimately appeared had a number of inaccuracies and generated a great deal of criticism from the centres themselves. This experience was not improved

any when, following the group presentation by Halcrow, all centres documented their concerns, none of which were adopted before the study findings were published. Despite these concerns, the Halcrow study has provided further evidence of the need for a performance framework which rewards SSCN centres for delivering against Scottish Government policy interests.

4.6 DEVELOPMENTS WITHIN THE WIDER UK SDC SECTOR

In contrast to the considerable changes in circumstances for the SSCN during the last four years the position for others, notably science centres in England, has, by comparison, languished. Only within the last year has there been a significant shift in interest in the English science centres by UK central government. This has seen a genuine flurry in dialogue between the centres, politicians and a host of other major stakeholders. The nature and outputs of these activities is briefly outlined below.

4.6.1 The funding of science and discovery centres

On 2 May 2007 The House of Commons Science and Technology Select Committee announced it was to hold an inquiry into UK SDCs. The impetus for this inquiry was the recognition, by UK central government, of the ongoing concerns over the financial viability of many of the UK's science centres, notably those that had received large capital grants from the MC, government's stress on the importance of young people studying and pursuing careers in STEM subjects and of regaining wider public confidence and engagement in science and technology. These concerns mirror those of the Scottish Executive when discussions began with the Scottish science centres in 2003.

The Select Committee invited evidence on two broad issues: The role of science centres in public engagement and attracting young people to science subjects and scientific careers; and secondly the funding available to such centres from central government, alternative sources of funding and ways of supporting the long-term future of SDCs. That these issues were of such visibility to secure a Select Committee inquiry is in no small part due to the work of ECSITE-UK, which, as highlighted in chapter one, has campaigned tirelessly for advocacy and a long-term funding relationship with UK central government since its formation in 2000.

Securing input from a significant number of stakeholders, the Select Committee inquiry fell some way short of recommending that the UK's science centres should receive funding. While recognising that the UK's science centres have a role to play in promoting science and community engagement, the inquiry was critical over the lack of evidence that demonstrated how effective science centres are in terms of their core goals. The inquiry also highlighted variable levels of coordination and cooperation between UK centres and encouraged ECSITE-UK to assess the different models that existed, including Scotland, in efforts to better identify areas of best practice and to promote better coordination from centres. The results of this assessment are briefly covered in *4.6.2 Inspiration, Engagement and Learning: The Value of Science and Discovery Centres in the UK Working towards a Benchmarking Framework* (<http://www.ecsite-uk.net/reports/value-of-science-discovery-centres-in-the-uk.html> [Accessed 25th July 2008]).

In recognising government's own coordination in relation to science centres could be improved, the Select Committee accepted an offer by the Minister for Science and

Innovation, on behalf of the Department for Innovation, Universities and Skills, to adopt departmental responsibility for science centres.

4.6.2 Inspiration, engagement and learning: The value of science and discovery centres in the UK working towards a benchmarking framework

In response to the House of Commons Select Committee inquiry, ECSITE-UK developed and published a report to better describe the key impacts that SDCs and museums make. Much of this evidence, including a number of case studies, was drawn from the membership of science centres, science museums, zoos and aquaria that make up ECSITE-UK. While highlighting some important examples of good practice and areas of success, the ECSITE-UK report fell some way short of quantifying the impact of its membership.

Importantly recognising that establishing a relationship with government is a long-term ambition, ECSITE-UK used their report to promote other important work they are carrying out for the UK sector, including development of a benchmarking framework. While still in its early stages, ECSITE-UK describe five initial steps in their efforts to realise a framework which science centres can use to measure, assess and quantify their success and impact. First, to collect consistent data across the SDC sector. Second, to join the Visitor Attraction Quality Assurance Service. Third, to sign up to the Department for Children, Schools and Families backed scheme, ‘Learning Outside the Classroom’. Fourth, to undertake evaluation of learning and impact using the DCMS-backed Generic Learning Outcomes (GLOs). Lastly, to commit to sharing ideas, knowledge and best practice with other science centres. I take cognisance of these steps when considering the model which emerges out of my own research.

A major challenge for ECSITE-UK, in advancing its own ambitions for a sector-wide benchmarking framework, is the extent to which it can encourage its large and very diverse membership to universally agree and adopt the full terms of engagement that such an approach would require in order to generate meaningful data. An initial pilot group of centres, restricted in number, which jointly agrees the necessary methodology might be a useful starting point. In this sense my own investigation may be of some use.

4.6.3 The impact of science and discovery centres: A review of worldwide studies

Published on the same day (29 April 2008b) as the report previously described ECSITE-UK also released a report titled *The Impact of Science and Discovery Centres: A Review of Worldwide Studies*. This review, essentially a short literature review, summarised and highlighted recent research into the impact of SDCs from around the world. Its key assertions were that significant evidence exists to support that interactive science exhibitions increase visitors' knowledge and understanding of science by providing memorable learning experiences delivered through a wide range of personal and social impacts. These can have a lasting impact on attitudes and behaviour and promote trust and understanding between the public and the scientific community. The report also highlighted evidence of the economic impact of SDCs. The very varied nature of research described in this review, its often specific examples, sometimes anecdotal evidence base, coupled with the absence of transferable performance indicators means its uses for being drawn on in my investigation were regrettably limited.

4.7 SUMMARY

In this chapter I have drawn from a significant volume of archival and documentary evidence in developing an audit of recent practice in Scotland, and briefly the wider UK and International science centre sector. This evidence points to the cyclical attempts of the Scottish Executive and now Scottish Government to develop a performance framework for the SSCN, against which both the outputs and outcomes of their activities can be measured, reported and importantly for centres, funded. Despite these repeated attempts no comprehensive framework has yet been adopted and now some four years after funding was initially secured. The archival material does, however, unify in where the potential benefits of the science centres lie in supporting both formal and informal learning and promoting the popularisation of science and this should not be lost in attempts to identify a unified performance framework for the SSCN.

An important issue highlighted by the conduct of the Halcrow study has been the importance of securing agreement from the major, non-government, stakeholders i.e. the science centres themselves. Had Halcrow attempted this through a more transparent and ongoing dialogue then the recent concerns over funding and the continuing debate about how funds are distributed across the SSCN might have been avoided.

In wider UK terms the recent interest in UK science centres by UK central government is very welcome, as is the work of ECSITE-UK in developing a benchmarking framework for the wider UK sector. There is value for ECSITE-UK in learning from the experiences of the SSCN in its efforts to secure advocacy and a funding relationship for its member science centres. Managing the expectations of UK central government to

what is currently possible with regard impact measurement and assessment might be a useful starting point.

In providing an explanation of recent change in the context of Scotland's four science centres there is clear appetite for advancing the development of a performance and accountability framework, which meets the needs of the SSCN centres and the Scottish Government. Earlier efforts to advance such a framework have been slow and substantially focussed on the Scottish context itself.

There is benefit to be gained from drawing on the experience of other science centre professionals, outwith Scotland, and in chapter five I do so. Chapter five focuses on the outputs of my first phase of telephone interviews with my assembled knowledge-community. The responses of my knowledge-community to this first wave of questioning informed the development of my second phase of interview questions and provided an early, but critical, foundation to advancing the development of a new performance measurement and accountability framework for the SSCN.

CHAPTER FIVE

FUNDING AND PERFORMANCE MANAGEMENT MODELS IN DIFFERENT COUNTRIES

5.0	INTRODUCTION	5-2
5.1	AN INTERNATIONAL KNOWLEDGE-COMMUNITY	5-3
	5.1.1 The development of science centres	5-4
	5.1.2 Size of main exhibition space	5-6
	5.1.3 Annual visitor attendance	5-14
	5.1.4 Main elements to science centres	5-14
5.2	EXPERIENCE OF WORKING WITH GOVERNMENT	5-15
	5.2.1 Existing funding relationships with government	5-15
	5.2.1.1 <i>Benefits of a relationship with government</i>	5-23
	5.2.1.2 <i>Reporting requirements of government</i>	5-26
	5.2.2 Awareness of other funding models	5-27
	5.2.3 Science centres and government policy on PES	5-28
	5.2.4 Government expectations of a funding relationship	5-31
	5.2.5 The wider science-in-society community	5-31
5.3	THE USE OF PERFORMANCE MODELS OR INDICATORS BY OTHERS	5-32
	5.3.1 Other best practice examples of performance indicators	5-33
	5.3.2 Structuring a new framework	5-35
	5.3.3 Limitations of current performance models	5-37
5.4	SUMMARY	5-38

CHAPTER FIVE

FUNDING AND PERFORMANCE MANAGEMENT MODELS IN DIFFERENT COUNTRIES

5.0 INTRODUCTION

In chapter four, I presented a detailed audit of the changing context for Scotland's four science centres, for the period 2003 – 2008. During this time the four Scottish centres moved from a shared position of financial vulnerability to becoming a national network, supported by Scottish Government funding. The commissioning of several independent reviews of this network by the Scottish Government has sought to inform future policy towards the science centres and led to cyclical attempts to create a performance management framework for the centres. The most recent review, by Halcrow Group Limited (2007), encouraged the Scottish Government to move away from its needs-based approach to funding the SSCN to one based on the performance of centres.

In addition to Scotland, I briefly considered the wider UK and international landscape for science centres and notably the recent efforts of English science centres to secure central government funding. This has similarly secured a recent wave of interest in performance frameworks and benchmarking and a commitment by central government to commission its own review of the potential value of science centres. Despite the recent flurry of activity in England any decision around financial support for English science centres, by central government, seems some way off.

In broadening my consideration of the government funding regimes and performance management models of other science centres, chapter five draws on the experience of an

international knowledge-community of senior science centre professionals. This input was secured over two rounds of extensive telephone interviewing and included senior representatives of the four SSCN centres, a number of their English counterparts and the chief executives of science centres from nine other countries. The significant volume of information collected through this process and my subsequent analysis of this begins to converge around areas of good practice. In presenting this information I address chapter five in three parts. In part one, I briefly describe the science centres represented by my knowledge-community. This small, but important, group illustrates the similarities and differences to be found within the science centre field. In part two, I consider the relationships my interviewees share with their governments, including funding models, the contribution of science centres in fulfilling government interests and expectations from a funding relationship with science centres and the role of others in supporting government interest in PES. In part three, I consider the experience of my interviewees in implementing performance models and associated KPIs, areas of best practice, structural aspects associated with their composition and application and importantly the limitations evident in the field and identified models. I conclude chapter five with a short summary of my key findings and their influence on the final phases of my investigation.

5.1 AN INTERNATIONAL KNOWLEDGE-COMMUNITY

Having previously touched on the diversity within science centres in chapter one, in this section I describe the major differences and similarities between the science centres led by the members of my knowledge-community. The basic data associated with each centre, including date of opening, original capital cost of each centre, size of annual attendance, size of exhibition space and major exhibition elements is captured in table

5.1. At first glance this data re-enforces my earlier comments (section 1.3.1 of chapter one) about the diversity of the science centre field. On closer inspection the data does show some patterns around international segmentation and subsequent development within the field.

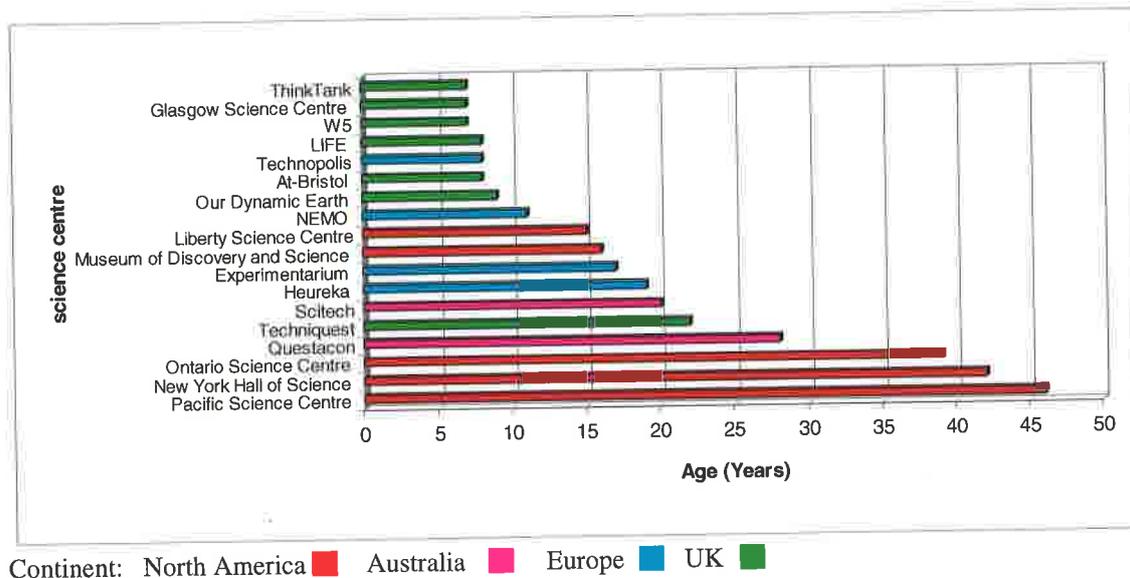
5.1.1 The development of science centres

The earliest science centres represented by my knowledge-community are all based in North America (see figure 5.1). Both the Pacific Science Centre in Seattle and the New York Hall of Science opened under a title other than that of ‘science centre’. In the Pacific Science Centre’s case it was as the United States Government’s Science Pavilion at the 1962 Seattle World’s Fair. The New York Hall of Science opened in 1966 as a museum and continues to operate as a museum. The Ontario Science Centre (OSC), along with San Francisco’s Exploratorium, are considered, by many in the sector, to be the first science centres as they are recognised today. The OSC was a gift to the people of Ontario by its Provincial Government in celebrating the occasion of Canada’s centennial.

The period encompassing the 1980s and early 1990s is marked by the opening of some Europe’s earliest Science Centres. This group, which includes Finland’s Heureka, Denmark’s Experimentarium and Cardiff’s Techniquest, represents some of the most respected and visible science centres in the field today. The chief executives of these centres have become important leadership figures in an increasingly global field. During the early, through mid, 1990s there was a spread of science centre openings across the USA, Europe and Australia with seemingly little pattern.

The youngest science centres represented in my knowledge-community have almost entirely (with the exception of Belgium’s Technopolis) been developed as a result of UK MC funding. The almost 40 year age difference between the earliest and most recent science centres represented by my knowledge-community highlights the maturity of the North American market compared with the relative infancy of the UK science centre sector.

Figure 5.1 Age of centres

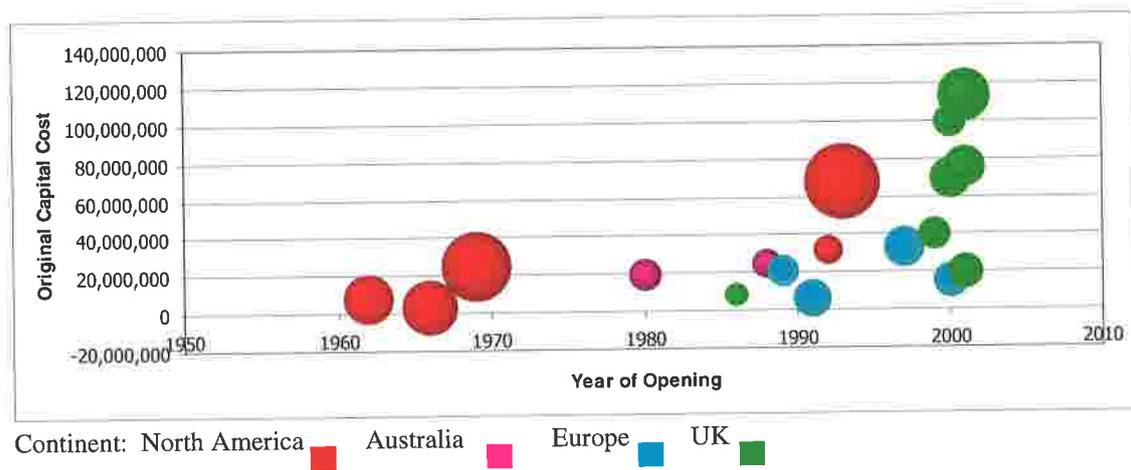


In contrast to the age of the science centres in my sample, the level of original capital cost of centres is almost the reverse. While this may be expected, given the almost forty year difference in opening between the oldest and newest centres, the level of capital investment in the MC-supported UK science centres is still quite staggering, particularly when considering the size of their exhibition space and levels of attendance when compared with others in my sample.

5.1.2 Size of main exhibition space

The North American science centres in my sample have the largest exhibition space, typically at least double the exhibition space of any other centre in my sample. I have graphically represented this by the size of bubble in the bubble graph shown in figure 5.2. This graph also illustrates that the earliest North American centres in my sample are the largest.

Figure 5.2 The size and cost of centres



Once again the relative mid-ground in my sample is held by science centres in mainland Europe, which opened between 1989 and 2000. The exception in my sample is Liberty Science Centre in the US. This centre originally opened in 1993 at a cost of \$68m and has a significant floorspace which was added to with a \$109m expansion between 2005-2007.

Table 5.1 The knowledge-community science centres participating in the research

Centre name:	Date of opening:	Original capital cost of centre (please estimate if part of a larger complex):	Annual visitor-attendance, last full-year:	Size of main exhibition space (square metres):	Main elements to science centre (e.g. permanent exhibition, IMAX, Planetarium, etc):
@t-Bristol (Bristol, England)	June 2000	£100m (original build costs included Wildwalk & IMAX)	150,000	3,400sq.m	Explore (permanent exhibition), Planetarium & Science Learning Centre
Dynamic Earth (Edinburgh, Scotland)	June 1999	£40m	193,000 (financial year)	3,300sq.m	Permanent Exhibition with 12 audio visual based galleries including split dome screen
Experimentarium (Denmark)	January 1991	App. £6m	343,556 (calendar year)	4,500sq.m	Main exhibition, two temporary exhibition areas, Great Stage, Small Stage, 8 meeting rooms, 2 laboratories
Glasgow Science Centre (Glasgow, Scotland)	July 2001	£76m	476,000 Admissions 337,000 Visitors	5,500sq.m	Science Mall, IMAX Planetarium, Glasgow Tower, 19 Learning Spaces (theatres etc)

Centre name:	Date of opening:	Original capital cost of centre (please estimate if part of a larger complex):	Annual visitor-attendance, last full-year:	Size of main exhibition space (square metres):	Main elements to science centre (e.g. permanent exhibition, IMAX, Planetarium, etc):
Heureka (Finland)	Apr 1989	€22m	283 000	total 3,500sq.m	Digital planetarium.
LIFE (Newcastle, England)	May 2000	£70m	213,000	4,400sq.m	Permanent exhibition, dome theatre, show area, ride simulator
Liberty Science Centre (New Jersey, USA)	1993 re-launched 2007	\$68m \$109m expansion during 2005-07	c.600k	17,500sq.m 29,500sq.m (whole building)	Permanent exhibition, IMAX Dome Theatre, Digital 3D theatre

Centre name:	Date of opening:	Original capital cost of centre (please estimate if part of a larger complex):	Annual visitor-attendance, last full-year:	Size of main exhibition space (square metres):	Main elements to science centre (e.g. permanent exhibition, IMAX, Planetarium, etc):
Museum of Discovery and Science (Fort Lauderdale, USA)	November 1992 (new facility)	\$32m (USD)	406,000 (Fiscal year 2007)	2,800sq.m	300 seat 3D IMAX theater museum store and café themed exhibits on aviation, space science, physics, health, early childhood, Florida environment, open air atrium with iconic kinetic sculpture, nature walk in “backyard”
Science center NEMO (Amsterdam, Netherlands)	July 1997	€33m	390,021	5,000sq.m	Permanent exhibitions Temporary exhibitions Education Programmes Education – and communication events Shop Food & Beverage

Centre name:	Date of opening:	Original capital cost of centre (please estimate if part of a larger complex):	Annual visitor-attendance, last full-year:	Size of main exhibition space (square metres):	Main elements to science centre (e.g. permanent exhibition, IMAX, Planetarium, etc):
New York Hall of Science (New York, USA)	1966	\$3m (USD)	412,089 for Fiscal Year ending 30 June 2007	10,000sq.m interior 6,000sq.m exterior	Permanent exhibitions inside, permanent exhibitions outside including 2 science playgrounds, Atlas and Titan rockets; 2 temporary exhibition galleries, small planetarium, auditorium, lunchroom, classrooms/laboratory rooms
Ontario Science Centre (Ontario, Canada)	September 1969	\$25m (Canadian)	2007-2008 FY – 1,070,663 2007 calendar year – 1,113, 933	14,500sq.m (does not include Imax theatre, planetarium, workshop spaces, corridors and walkways)	Permanent exhibition halls, planetarium. Imax dome theatre, outdoor exploration plaza, 500 seat auditorium, numerous workshop and classroom spaces

Centre name:	Date of opening:	Original capital cost of centre (please estimate if part of a larger complex):	Annual visitor-attendance, last full-year:	Size of main exhibition space (square metres):	Main elements to science centre (e.g. permanent exhibition, IMAX, Planetarium, etc):
Pacific Science Center (Seattle, WA, USA)	1962	\$8m – estimated. It was the US Government's science pavilion at the 1962 Seattle World's Fair	1,023,000 for the fiscal year ending 30/06/07	7,700sq.m for exhibits. Total is 17,700sq.m including theaters, offices, classrooms, café, etc.	Permanent exhibition halls 2 IMAX theaters, 1 is 3D classrooms Planetarium Tropical butterfly house Laser light auditorium Remote site environmental education center Outreach van program taking science to 250,000 school kids annually
Questacon-the National Science and Technology Centre (Canberra, Australia)	Originally opened in 1980. Renamed National Science and Technology Centre opened in 1988	\$19.3m (AuD as NSTC)	403,000 visitors to Centre 344,314 visitors to outreach programs 1,179,495 visitors to Questacon traveling exhibitions 2,094,649 visitor sessions to Questacon website	3,500sq.m	7 exhibition galleries , one theatre, two small presentation spaces, two multipurpose rooms, shop, café

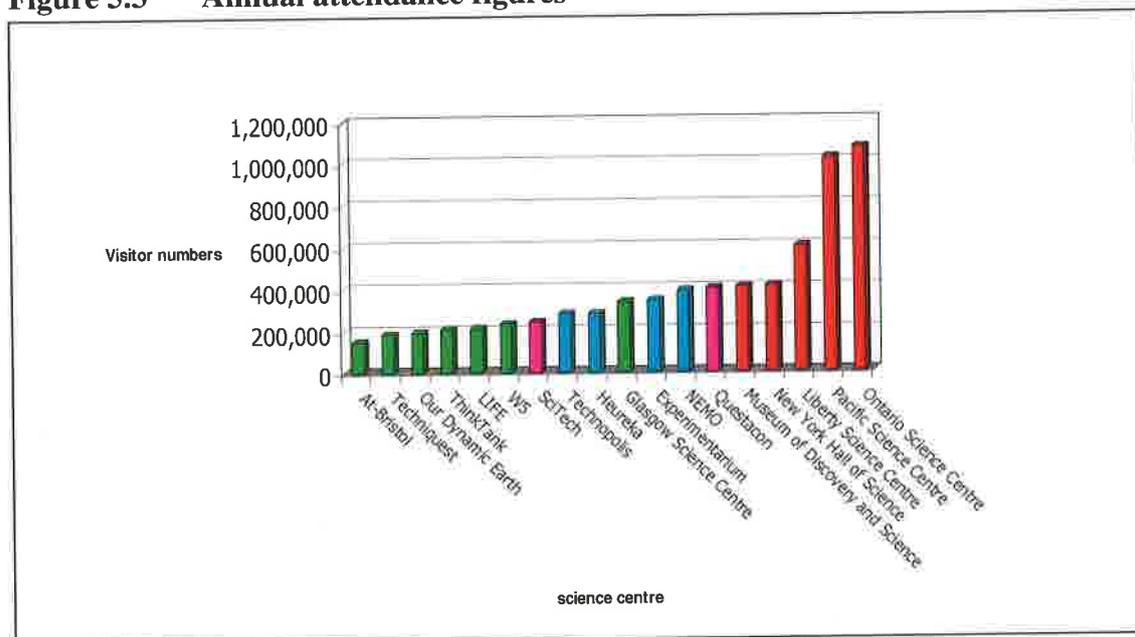
Centre name:	Date of opening:	Original capital cost of centre (please estimate if part of a larger complex):	Annual visitor-attendance, last full-year:	Size of main exhibition space (square metres):	Main elements to science centre (e.g. permanent exhibition, IMAX, Planetarium, etc):
Scitech Discovery Centre (Perth, Western Australia)	1988	\$AUD 25m	245,000 July 07 to June 08	2,700sq.m	Planetarium, traveling exhibition gallery, Science Theatre, Puppet Theatre, Early Childhood gallery, Science Laboratory, Digital Technology Studio, Professional Learning Programs for Classroom Teachers, Public Programs in Community, Outreach Programs and Design and Construction Workshop
Techniquet (Cardiff, Wales)	1986 originally. Present building opened 1996	1996 cost approx £8m	Year to March 08, attendance was 187,593	1,800sq.m	Permanent exhibition Small planetarium 1 lab science theatre

Centre name:	Date of opening:	Original capital cost of centre (please estimate if part of a larger complex):	Annual visitor-attendance, last full-year:	Size of main exhibition space (square metres):	Main elements to science centre (e.g. permanent exhibition, IMAX, Planetarium, etc):
Technopolis [®] , the Flemish Science Center (Belgium)	February 2000	Exhibition: €3.2m Building: €12.5m	282,067 (calendar year)	Permanent exhibition + Children's Science Center: 3,730sq.m Temporary exh. space: 756sq.m Outdoor Science Garden: 1,008sq.m	Permanent exhibition; temporary exhibition space; children's Science Center; outdoor Science Garden; multifunctional area (events ...); auditorium; theatre; shop; self-service restaurant and picnic area; workshop & demo rooms
Thinktank (Birmingham, England)	September 2001	Difficult to disaggregate from £114m Millennium Commission gross expenditure	Financial year: 300,000 total (of which 210k+ to Thinktank; 110k+ to IMAX)	9000sq.m + IMAX	Permanent exhibition, temporary exhibition space, IMAX, Planetarium, classrooms, conferencing suite, lecture theatre
Whowhatwherewhenwhy (W5) (Belfast, Northern Ireland)	March 2001	Approx. £20m but part of a bigger scheme	Financial 235,000 admissions, 265,000 including outreach and corporate clients	3,900 sq. m.	Permanent Exhibition space, Start, Go, See, Do and temporary exhibition space

5.1.3 Annual visitor attendance

The most visited science centres in my sample are those based in North America (see figure 5.3). Both OSC and the Pacific Science Centre attract considerably more visitors than any other centre in my sample. In contrast, the five least visited science centres are all based in the UK. This is perhaps surprising given the high original capital costs associated with these centres. The exception, in UK terms, is GSC albeit, if just considering visitors to the exhibitions of the centre itself, the numbers fall to within those typically seen across other science centres in mainland Europe. Science centres based in mainland Europe hold the middle ground in my sample with annual attendance figures ranging between 280k and 390k.

Figure 5.3 Annual attendance figures



Continent: North America ■ Australia ■ Europe ■ UK ■

5.1.4 Main elements to science centres

The diversity in age, cost and scale of science centres in my sample is matched by the diversity of their content. All centres have a permanent exhibition and space for hosting

temporary exhibitions but of different sizes. Other popular elements are IMAX theatres, planetariums and auditoriums.

5.2 EXPERIENCE OF WORKING WITH GOVERNMENT

In the same way as the opening pages of this chapter highlights the great diversity between different science centres, the relationship each shares with its government is similarly different and, unlike previous descriptors, takes little account of national boundaries.

5.2.1 Existing funding relationships with government

Table 5.2 records the level of public-sector funding received by the science centres in my sample. The notable absence in this table are the English science centres in my knowledge-community, who have yet to establish a funding relationship with central government.

Levels of government funding, within the recipient group, range from 5% to 73% as a percentage of total turnover. The recipient of the highest percentage of funding, the Royal Belgian Institute of Natural Sciences (RBINS) is, strictly speaking, a museum rather than a science centre and in this regard qualifies for levels of government support that would typically be closed to science centres in the UK. The split in types of funding received by RBINS also illustrates that government funding can have several forms: in RBINS case, revenue support, for covering running costs, but also project-related funds, typically for education-based programmes. Capital-funding for exhibition development is also common. Other high recipients of government funding were the OSC (45-50%)

Table 5.2 Government funding of knowledge-community science centres – international comparator

Centre name:	Amount of government funding received:	Percentage of government funding to overall turnover:	Main government department:	Main areas of government interest in return for funding:
Cosmos Science Centre (Netherlands)	€6,000 €50,000	60%	Local Government Ministry of Education & Science	- Access for local community; - boost for tourism; - access for primary education
Dynamic Earth (Edinburgh, Scotland)	£380k	12%	Education – Office of the Chief Scientific Advisor	- Promoting science in society; - promoting uptake of careers in the Sciences
Experimentarium (Denmark)	3.2MDKK = £320,000	5%	Department of Education	- Supply the education in the primary and secondary schools; - communicate research in science and technology; - communicate facts about a healthier life; - help unemployed people to a new start in the working area; - help disabled people start a new job
Glasgow Science Centre (Glasgow, Scotland)	£1,754,000	28%	Education – Office of the Chief Scientific Advisor	- Promoting science in society; - promoting uptake of careers in the Sciences.

* English science centres not shown due to the absence of a current funding relationship central-Government

Centre name:	Amount of government funding received:	Percentage of government funding to overall turnover:	Main government department:	Main areas of government interest in return for funding:
Heureka (Finland)	€3,247,500 (national) €2,309,106 (city)	36.8 % 26.1 %	Science budget General	- Exceptionally high because of capital investment in new planetarium in 2007; - to strengthen science awareness; - to have a national cultural facility in town and promote image of the city.
Liberty Science Center, Jersey City (US)	\$5.75m in FY08	Approx. 20%	Department of Education, State of New Jersey	- Science learning and teaching services for students, teachers and families in State-designated at-risk districts.
Ontario Science Centre (Canada)	\$15.3m annual operating grant \$3.9m in “occupancy” to cover operating costs of government owned building (OSC does not control that expenditure) \$1.1m in grants from competitive grant programs All of this is from the Province.	In 2007, government provided approximately 50% of OSC operating budget	Ministry of Culture	- OSC is considered to be a major cultural institution. Like a major museum or art gallery, our existence is considered to be an essential element of a “mature” society. Our legislation establishes major objects for the OSC and we file a Business plan each year.

Centre name:	Amount of government funding received:	Percentage of government funding to overall turnover:	Main government department:	Main areas of government interest in return for funding:
Pacific Science Center (US)	\$6.15m Normally receive \$3m in government support, a percentage of 17%.	28%	State of Washington \$5.3MM Federal National Science Foundation \$0.85MM	<ul style="list-style-type: none"> - State: Science Ed. Reform in K-12 schools \$4.1m (changing the way science is taught in all of our public schools), Subsidizing school visits and science outreach \$1.2m. - Federal: Outreach science to Spanish speaking immigrants \$0.25m, R&D to learn how to link current scientific research scientists with the public \$0.6m.
Questacon (Australia)	\$11m Aus\$ in 2006-7	59%	Department of Innovation, Industry, Science and Research (from November 2007, prior to this Department of Education, Science and Training)	<ul style="list-style-type: none"> - Science and Technology awareness; early childhood and Indigenous education; rural, regional and remote outreach programs; innovation training; - Centre operation.

Centre name:	Amount of government funding received:	Percentage of government funding to overall turnover:	Main government department:	Main areas of government interest in return for funding:
Royal Belgian Institute of Natural Sciences (Belgium)	Running budget + salaries : €17,203 Projects funding : €4,033 (yearly average. The funding is based on call for proposal, and depends on the success of our applications)	73 %	Federal Scientific Policy	- Defined by RBINS' mandate (see Royal Decree of 8 April 2002, which includes 1/ research, 2/ support to public policies, 3/ collections study and management, 4/ dissemination of knowledge, in the field of natural sciences. - Projects : return is defined in the project's deliverables
Scitech Discovery Centre, Perth. (Australia)	\$3,150,161 for 06/07 financial year.	39.15%	Department of Industry and Resources.	- Delivering science education programs and interactive exhibits for school aged children and their teachers throughout Western Australia; Raising science and technology awareness in the WA community.
Techniquet (Wales)	Core grant £1,050,000	31% currently	Department for Children, Education, Lifelong Learning and Skills, Welsh Assembly Government	- Education; - Health; - Industry

Centre name:	Amount of government funding received:	Percentage of government funding to overall turnover:	Main government department:	Main areas of government interest in return for funding:
Technopolis® (Belgium)	€2,701,666	43.31%	Department for science, technology and innovation	<ul style="list-style-type: none"> - Public awareness science & technology; - gender; - career choices
W5 (Northern Ireland)	£450,000 W5 also receives additional funding from government and semi-government bodies in return for the delivery of specific education programmes	10% This is an indicative %age. This can vary widely from year to year, depending on the level of activity within the Funded Programmes	Dept of Culture, Arts and Leisure (DCAL), Northern Ireland	<ul style="list-style-type: none"> - Centre for both formal and informal science education; - contributing to objectives of the Programme for Government for Northern Ireland, particularly in relation to tourism and education and in improving access to education

and Canberra's Questacon (59%). Both science centres are part of their government's structure, with OSC forming part of the Province's 'Ministry of Culture' and Questacon, a part of the 'Department of Education, Science and Training'. For this reason it is maybe unsurprising to learn that both centres receive higher levels of funding than others. A note of interest is that OSC now receives less funding than it has in previous years and its chief executive, Lesley Lewis (round one interview, 08/11/07), views this as a positive development:

I'm really glad that we are no longer fully funded by government. From my assessment of what the situation was when OSC was entirely funded by government it was a less focussed organisation...I like the fact that where we are is a mid-point, we've got very strong government support but we are able to operate in an entrepreneurial fashion.

This shift in funding by the Province of Ontario has been applied in a stepped approach and is described by Lesley Lewis (round one interview, 08/11/07):

For approximately the first 21 years of existence we (OSC) were fully funded by government. In the early 1990's that relationship began to change and it changed quite rapidly. By 1998 government was covering 60% of the operating costs and today (November 2007) we get a fixed operating grant from the government which usually makes up around 45% of our operating budget.

In contrast to OSC and Questacon half of my sample received between 20% and 43% of their total turnover from government. That OSC is funded by its Provincial government has already been highlighted; others receive their funding from either local-government (Provincial, State), national or central-government (Federal) or a combination of both. Others receive government funding for programmes through third-party organisations like the National Science Foundation (NSF) in the US. Lesley Lewis (round one interview, 08/11/07) has an interesting perspective on these apparent differences:

In the US when you speak to people [in science centres] they often say they don't get government funding but when you dig a little deeper you realise there are government funded organisations such as the NSF, which provide large amounts of funding through competition. For large science centres in the US, if they include that money, it suddenly starts to look as if we roughly get the same amount of our funding from government – we just get it in different ways.

In each case the science centres linked with my knowledge-community had different terms of funding from their governments, typically three to five years. Several only had their funding confirmed annually which restricts their ability to plan beyond a very limited time-frame.

The government funding of science centres is typically channelled through a main department, albeit most in my sample work with a range of departments on matters as diverse as education, culture, enterprise, health, the environment, water and even defence. The main Departments or Ministries to which science centres report included Science (often including Innovation, Technology or Research), Education (often including Children, Skills, Lifelong-learning), Culture (with Arts and Leisure) and Industry. Each main sponsoring government-department clearly has a slightly different focus in terms of major areas of interest but these commonly fell within supporting the formal education system in schools, specifically in-terms of science and technology; generating wider awareness of science in society - with a notable accent on widening community access and promoting uptake of careers in science-based jobs. Other areas of interest included the cultural and tourism contribution made by science centres, notably recognisable in those centres whose main sponsor was their Culture Department. These themes compare favourably with the six principal themes of the

Scottish Government's Measuring Success paper (see appendix 8) highlighted in section 4.1.2 of chapter four.

When asked which were the main government-departments which had an interest in PES, the majority of my interviewee's highlighted education, followed by trade and industry/economic, and only then science. In total my interviewees identified over twenty different departments with several suggesting that all government departments had a vested interest in promoting PES.

5.2.1.1 Benefits of a relationship with government

My sample identified funding as the major benefit of developing a relationship with government. Several identified factors for which a funding relationship was important, including providing financial stability. Funding gave recipients the ability to undertake strategic planning and allowed them to continue pursuing their mission. The term of funding agreement, typically between three and five years, was also considered important by respondents.

A relationship with government was viewed as a beneficial mechanism through which to develop relationships with other important stakeholders. In this regard a relationship with government was viewed as symbolically important. Many of the science centres represented by my sample expressed a positive relationship with their government. Many of these relationships had been cultivated over many years, with tenure of civil servants and stability of government cited by several as essential to developing a meaningful and productive relationship. This view was offered by Per Edvin Persson (round one interview, 25/10/07) chief executive of Heureka in Finland:

in Finland the national government and the civil servants are usually staying there for pretty long time, so I think we have a very good working relationship with the civil servants and the ministry indeed, and we are really working with the civil servants.

Factors that interviewees highlighted as important included that a relationship with government enabled centres to become more politically astute, provided them access to information which they would otherwise not be able to see and made them more attractive to potential corporate sponsors. A small number also felt that a relationship with government provided an important mechanism through which to influence government policy. The importance of relationship between respective governments and their science centres was a theme repeatedly touched on during my interviews.

In addition to benefits, a number of my interviewees identified potential consequences of developing a relationship with government. These included the science centres mission becoming led by funding and in doing so making it vulnerable to associated funding cycles, the onerous reporting requirements often associated with government funding and the frequent absence of links between government-based objectives and required performance measure. None of my interviewees suggested any of these were reasons not to enter into a funding relationship with government but highlighted them as areas of likely concern and potential consequence.

In briefly considering the benefits to *government* of working with science centres the most common response from interviewees was that their centres promote the region or country to others and typically internationally. Others considered that science centres provided an important support mechanism for science education in their schools and in fulfilling a public engagement role. Graham Durant, chief executive of Questacon in

Canberra, highlighted both benefits in his own response (round one interview, 27/10/07), while additionally highlighting the contribution of science centres to the economy and tackling visitor/audience access issues:

Well, there are a whole range of benefits to society, and benefits to government [of science centres working with their government]. The broad societal benefits are in terms of education, in terms of social cohesion and equity of access in terms of science projects. There are significant economic benefits in terms of the direct benefits, in terms of jobs and taxes, and in terms of tourism, and the dollars from bed nights and restaurants, etc. We pay for services, and of course we do a lot of work with local companies: we are in partnership with other agencies, to develop the economic basis of Canberra. So we are part of the significant tourist industry and in the educational tourist industry. We also support the government marketing education abroad. For example, we put our exhibitions in Korea with Australia Education International who use the situation to try and sell education in Australia at school and higher education levels.

You asked specifically for the benefits to government, and the benefits to government are simply because we operate nationally, We are based in Canberra but most of our operations run across Australia which you will appreciate is a big country and so we engage with many different constituencies, and most federal MP's have a Questacon program at some point in any one year. So we can demonstrate it is an Australian government commitment to the rural, regional, remote areas so they get direct benefit from that... and we work very firmly and deliberately in the area of cultural diplomacy, and Canberra, being a national capital gives us particular opportunities to do that, because we have 105 embassies and High Commissions here. We are able to put programmes and products abroad, either directly hiring exhibitions out or working closely with organisations in other countries, or working with some of the aid agencies, such as UNESCO or AUSAID, to take educational programmes to disadvantaged communities and disadvantaged countries.

Despite concerns expressed later in this chapter (see section 5.2.3) around the need for science centres to maintain political neutrality the majority of interviewees also felt that science centres had the potential to support government policy on PES. Per Edwin

Persson (round one interview, 25/10/07) described such a role for science centres in supporting government policy towards PES:

Well, I think the need for public dialogue, communication and promotion [in addition to supporting science education and careers promotion highlighted earlier in the interview], I mean the question that you need in order to have informed decisions about science is that you need an informed population and you need different channels [to include science centres] to reach out to this population, so there is a real communication issue here too I think.

The potential for science centres to fulfil a supporting role for government, along with other appropriate mechanisms, was highlighted by many of my interviewees.

5.2.1.2 Reporting requirements of government

All interviewees had a reporting requirement in return for their government's funding. Most described having to report against a combination of outputs-based performance measures of either a quantitative (most common) or qualitative nature. Some highlighted the use of survey data and other forms of research in supporting reporting requirements against qualitative measures. Beyond this, interviewees reported a variety of reporting requirements and particularly in relation to programme related funding. One major area of variation amongst interviewees was in the frequency with which they were required to report to government. While many had an annual reporting requirement, often associated with their business planning cycle, others reported as frequently as quarterly.

Of relative absence, from existing reporting requirements to government, was any reporting against science centre *impact*. When impact was mentioned by interviewees

this was in relation to either educational impact or economic benefits, driven as a direct result of the science centre's existence in a region.

5.2.2 Awareness of other funding models

When I asked interviewees about their knowledge of funding models between other science centres and their governments the responses were surprisingly scant. Per Edvin Persson (round one interview, 25/10/07) offered a broad international perspective on current funding models:

In Asia, you would tend to have science centres heavily supported by the government, and often they would even be part of government, part of the public realm, and then correspondingly there would be a small amount of money that they would earn themselves. And when you come to Europe you have mixed situation, with people like us who have to earn a substantial amount of their budget, but still get a substantial proportion in support, you have actually the whole scale in Europe. You have places like La Villette where you have 78% public support, and then you go to Experimentarium in Denmark that has the same amount in earned income, so it's all the way in between. And again, if you go to North America you would have more dependence on the income, but still surprisingly, many people don't realise this, but in many American science centres there's actually up to 1/3 very easily public money. It may be in the form of contracts so there is not in the form necessarily of a subsidy, but still they would be doing work with public money. And then of course, Latin America is more like Asia, so that would be more and more government funding, not perhaps part of government, and then Australia I think is again more heavily dependent on earned income than in Asia.

In total, fifteen different models were identified but few, if any, were able to describe any of these in any detail. The most commonly-highlighted model was that of the National Council of India, which is heavily supported by the Indian government and which exacts a heavy toll on its supported science centres in reporting against an extensive range of KPIs. Several also mentioned the US-based NSF model which funds specific projects in US-based science centres. Centres seek NSF funding on a

competitive basis, with successful applicants having to undertake an evaluation process. This practice involves a peer review element that adds further credibility to the process. Interviewees highlighted aspects of several other models they were aware of and which could have some bearing on the later stages of my investigation. These included the growing shift in interest by governments around the world from output based measures to outcomes and impacts.

The relative lack of awareness and understanding of other government funding models for science centres across my knowledge-community could have been due to a number of factors. The most likely of these is that interviewees who did demonstrate particular understanding of alternative funding models had worked with science centres in other countries but also importantly other governments, typically in a consultancy capacity. Another factor may be that each government typically determines the nature of relationship it has with its science centres and not the other way around. In this regard the ability of science centre chief executives to be able to influence this relationship and suggest alternative funding-models, is in all likelihood, limited. In this regard there is arguably little necessity for the science centre chief executive to have an extensive knowledge of what funding models work well in other countries.

5.2.3 Science centres and government policy on PES

When asked whether science centres could influence government policy related to PES the majority of my interviewees responded positively. Several interviewees provided specific examples where this had happened - Finland's Heureka had worked with its government to develop 'science and society' initiatives; Techniquest in Cardiff had fed directly into the review on science policy in Wales; and Scitech in Perth, Western

Australia, had been asked to write its State science policy and also took part in developing its State education policy.

Essential in all of these examples was that each of the centres had developed a positive relationship with its respective government. While relatively few examples of science centres influencing policy towards PES were offered, a number talked of the potential for centres to play such a role. Graham Durant (round two interview, 29/01/08), suggested:

Well firstly, it is possible but it's not easy. You need to be involved in key conversations and you need to be attached to key people; you so you need to seek these opportunities for engagement and get involved in committees and find out how science and science policy works and position yourself where you take part in the discussions at the right stage, and one of the things I've learned by coming here and being part of the Australian Department, something I did not realise in Scotland, just how policy is developed, over what period of time, where the leverage points are, the points where you can actually insert yourself into a debate. And it's not constant, so you have to be alert to those opportunities.

The importance of active science centre engagement highlighted by Graham Durant was picked up by Per Edvin Persson (round two interview, 22/01/08):

how do you actually measure or show that you have influenced government policy. Shall we say, that if you are invited as a stakeholder at the table then I think you have performed something. So if you are a part of a government board or advisory committee I think yes, that would be an indication, and I think we do have that kind of evidence from various countries, certainly. I mean that science centres are represented in different forms and in different ways, I'm thinking of in Finland, we had a committee to set up a National programme for Science and Society and we were involved.

The comments of these two chief executives were mirrored by other interviewees who highlighted several factors that first needed to be considered if a contribution by science

centres was to be made. These included the need for science centres to maintain political *neutrality* and scientific *objectivity* when working with government - several interviewees expressed concerns in terms of the prospect of science centres supporting specific policy interests in return for funding. Lastly, as highlighted by both Graham Durant and Per Edvin Persson, was a need for the science centre be in a position of influence e.g. sitting on key groups within government administered think-tanks, NGO's.

Despite general support for the idea that science centres could influence government-policy, a small number of interviewees had seen little evidence of science centres having achieved this by themselves. In briefly considering the contributory role of science centres in supporting wider government policy on science, a number of roles were highlighted by interviewees, and included centres assuming a co-ordinating role for local, regional and national science in society initiatives and becoming a facilitator for creating and developing linkages with interested parties e.g. schools, academia, industry, etc. The opportunity afforded by establishing such roles for centres would be in developing them as platforms for supporting politicians and informing future government-policy towards PES. Several existing mechanisms, employed by science centres, were identified as potentially meaningful starting points including the growing use of public forums, such as *café scientifique*, for encouraging debate/engagement around contemporary and controversial scientific issues and the participation of many science centres in road-shows and national science-weeks. Once again, several interviewees expressed concerns that in all of the above science centres should maintain their neutrality and objectivity.

5.2.4 Government expectations of a funding relationship

The most common response of my interviewees to the question of what should government be seeking in return for providing science centres with funding was that centres play a democratising role in promoting public engagement and awareness of science and could be a powerful vehicle for government in this regard. In the same vein several interviewees also considered public '*reach*' afforded by science centres important to government. Science centres are becoming increasingly adept at widening access beyond traditional audiences, through increasing use of alternative programming, partnership and support initiatives for schools. These qualities are likely to be viewed as of a premium by political parties keen to reach out to all sectors of the community.

A small number suggested a role for science centres in showcasing contemporary science and scientific-research. Interviewees also felt that government should expect a quality service delivered by their science centres and supported by qualitative research.

A few interviewees stated that science centres should be able to demonstrate accountability in return for receipt of public funds and in order to do so government should define its priorities in specifying what it wants from a relationship with its science centre. A review of contracts between science centres and their governments would have been additionally useful in better quantifying existing wants and needs of government from a relationship with its science centre(s) but was not possible due to confidentiality constraints.

5.2.5 The wider science-in-society community

I asked interviewees to consider other, non-government, stakeholders that science centres should be working with in efforts to deliver their science learning/PES agenda.

The majority of interviewees identified universities as their most common response. Other stakeholders identified included industry/future employers; research councils/research organisations; the education sector/community; professional associations; skills/life-long learning agencies; the media and local government. This short, and non-exhaustive, but important list highlights that science centres are only one amongst many other organisational types that have an interest in promoting science learning and PES, many also funded by government. In addition to reinforcing the point that science centres only have a contributory role to play in advancing government aspirations for promoting PES, it also points to the potential of a further likely 'want' of government in funding science centres - partnership.

5.3 THE USE OF PERFORMANCE MODELS OR INDICATORS BY OTHERS

In section 5.2.1.2, I highlighted that all of the members of my knowledge-community, who had a funding relationship with their governments, also had an associated reporting requirement. While varied in nature, the basis of each relationship was a funding model supported by a range of PIs. Rather disappointingly for me was the relative lack of sophistication in any of the indicators or the more widely encompassing models that interviewees described. When asked what a performance framework for science centres should look like interviewees did, however, describe a number of elements:

- Any framework should be relatively simple;
- It should contain a mix of quantitative (attendance figures, financial indices) and qualitative (exhibition, quality of science) measures;
- It should include impact (engagement and economic)/outcome based indicators;
- It should consider how it contributes to delivering against governments agenda;

- It should consider different components of science centre activity (social, economic, intellectual);
- It should be specific, measurable, achievable, relevant and time-based (SMART), but also comparable, objective and understandable;
- A balanced-scorecard approach was mentioned by several;
- It should be externally evaluated.

Few, if any, of the models described by interviews, in terms of their own institutions, incorporated more than a handful of the elements described above. This may be because science centres only typically play a small part in determining what means and methods of reporting are required in return for government funding. The scope to have such a discussion with government is clearly a desirable one.

5.3.1 Other best practice examples of performance indicators

I asked my interviewees if they were aware of any proven PIs for science centres, and if so if they could describe these. Again, somewhat surprisingly, many of my interviewees replied they were unaware of any proven indicators, feedback that highlights a potential concern, coupled with earlier responses, that science centres are not regularly talking to each other about performance-related issues.

Seven of my interviewees identified PI models and of these the model employed by the Belgian science centre, Technopolis, featured most prominently. Technopolis has recently extended its contract with the Flemish government, having completed an initial four-year contract in 2007. The basis of the Technopolis model is twenty defined PIs. Delivery against these indicators determines the exact level of government-funding received by Technopolis, and on a sliding scale depending on how many indicators meet or surpass agreed performance levels. All of the Technopolis PIs are either

quantitative, e.g. visitor numbers, length of stay, entrance fee, geographical distribution of visitors, or qualitative, e.g. visitor satisfaction, qualitative offer, quality control in nature. Those interviewees who knew the Technopolis model well said that the associated collation of data and reporting required was extensive and resource intensive. The model and its reporting implications are described by Technopolis chief executive, Erik Jacquemyn (round one interview, 26/10/07):

We have a five year agreement with the government which ends this year (2007).

We are now in the course of an evaluation and negotiation of a new five year agreement. We are obliged to meet formally with the government officials at least four times per year as well as to make an official report about the working year. When printed out on paper, it comes down to five or six ring binders, in total it is 10 cm high or something. The report deals with the activities in the science centre plus the outreach. Of course there is also a financial report as well as a report on the performance indicators.

Within the contract we have twenty performance indicators which are defined: sixteen are defined for the science centre, four are related to the outreach activities. The sixteen are constant during the five years, the four however can vary because some outreach programs will not take place five years in a row.

While historically absent of impact-related measures, Technopolis has recently (2008) introduced a new indicator for measuring 'impact'. While the detail of this performance indicator was unclear, Technopolis has committed to annual impact assessment of its activities in efforts to determine their effectiveness. This development, at the beginning

of a new cycle of government funding, is reflective of the wider and growing emphasis that governments are placing on outcomes and impacts in return for continued funding.

Other than Technopolis, interviewees offered few examples of structured PIs. In broad terms, interviewees described what currently exists as *overly* quantitative. In this regard it is perhaps unsurprising that the main PIs interviewees identified were around visitor numbers or attendance and performance against business-related objectives. In relation to visitor numbers, several well tested PIs were highlighted, including customer satisfaction, dwell-time, or length of time spent by visitors in the centre and market-share of visitors by catchment. Several interviewees mentioned the ASTC visitor-related ratios. As a US-based membership organisation for SDCs, ASTC captures a significant volume of data from its membership, often, but not exclusively, expressed in the form of ratios. Many of these ratios have a visitor-related component.

In relation to business linked PIs, interviewees highlighted several that were likely to be of interest to government. These included the level of income earned by centres, the percentage of science centre income received from government sources, the percentage of income generated from other/non-government sources and organisational efficiency measures. Many described these financial-linked PIs as hygiene-factors - factors whose management was the responsibility of each centres Board of Trustees/Directors and so something which, as long as managed well, should not be of major concern to government.

5.3.2 Structuring a new framework

Considering the lack of uniformity in the use of performance models across my knowledge-community, I was keen to capture interviewee views on how a framework

of PIs for science centres might best be brought together. In addition to the comments from interviewees captured in section 5.3, and earlier concerns expressed by interviewees around the historic preponderance on quantitative outputs, I was keen to establish how a balance between easily-measured PIs and those which are consequential but arguably more difficult to collect, might be struck? Disappointingly, the responses from interviewees offered me little new insight. While some suggested that any framework should be entirely outcome-based they had no substance with which to support how this might work. Instead, what was offered typically focussed on striking a balance between qualitative and quantitative outputs rather than between outputs and outcomes. The use of a balanced-scorecard approach was mentioned by two of my interviewees. Based on its earlier appearance in section 2.3 of chapter two in relation to use by DCMS-sponsored museums, a balanced-scorecard approach warranted further consideration in efforts to balance any framework in relation to governments expressed interest in the demonstration of economy/efficiency and effectiveness in return for public-funding. This was considered during the final, face-to-face, meeting I held with my SSCN representatives.

All of the evidence I had collected to this point demonstrated that science centres are currently much better placed to report against performance outputs than they are against more consequential outcomes with several members of my knowledge-community pointing to the need for more research in this area. The NSF was highlighted as one organisation that was attempting to develop *impact* measures for science centres.

I also asked my interviewees whether there were themes around which PIs should be grouped. While many different themes were identified, the most common were quality,

in relation to service and programming; audience based, including segmentation, attendance and related ratios; business performance linked, including efficiency; and education-linked, including impact and widening audience uptake of science. When asked to consider how robustness of performance measures in each group might best be demonstrated interviewees felt that common language, definitions and collection methods, plus independent research and audit were important. From an external audit perspective interviewees felt those best placed to conduct this research were others working at a senior level in the science centre sector. This form of peer review is already administered effectively as a function of the ASTC full-member scheme. Other standard measures for determining scientific robustness such as sample size, repeatability, triangulation of measurements and use of trend analysis were also suggested.

5.3.3 Limitations of current performance models

There are several current limitations within the typical science centre performance model, if the experience of my knowledge-community is considered representative of the wider science centre community. The relative absence of any best practice models and limited knowledge of others was very apparent. The models which were highlighted were often based on a combination of quantitative and qualitative outputs, with little evidence of any outcome or impact-based PIs that signpost the real value of science centres in promoting PES.

While PIs were in evidence in centres across my knowledge-community, few appeared to have been assembled into a coherent or cohesive framework. Typically PIs were a feature of centres annual business planning process and as such sat within the broader

context of centres own business plans. While this, in itself, was not an issue of major concern, the relative absence of meaningful performance measurement, coupled with the growing expectation of government for outcomes to have been demonstrated was.

5.4 SUMMARY

In this chapter I have presented the experience of the science centres represented by my knowledge-community, drawn on their experience of working with their governments in return for receipt of public funding and described their use of PIs in fulfilment of their own reporting requirements. The information provided by interviewees of their own science centres demonstrated their diversity, one of the difficulties I encountered in advancing a consensus performance framework for the SSCN. The responses of my interviewees also demonstrated the importance of taking account of context – both individually and nationally in my own efforts to secure consensus deemed to be credible.

The relationship which each centre shares with its government is also of significance to my investigation. These relationships typically involve different government departments, different levels and types of funding, different reporting requirements and different areas of interest in science centres from government. The science centre's relationship with its government is significant in terms of reflecting government thinking around PES and on science, and the degree to which centres are seen as a support mechanism for wider science in society initiatives.

Surprisingly, the science centres in my study group seemed relatively new to performance measurement, as a function of government reporting. This was evidenced by the general lack of sophistication in any of the performance measurement across my

knowledge-community. While my interviewees were able to talk cogently about their performance measurement aspirations, the relative absence of meaningful performance indicators, grouped within a framework, did throw up challenges for the level of sophistication I was likely to realise through my own investigation. In spite of the varied experience within my sample, general trends, notably around clustering of performance indicators did begin to emerge.

In chapter six I develop my understanding of the themes which began to emerge from my first round of interviews by discussing them with the members of my knowledge-community. The responses of my knowledge-community to my first phase of telephone interviews heavily shaped my approach to my second round of interviews. Through this development process I built a broad-based consensus around what a performance framework for the SSCN could look like. My second round of interviews provided an important contribution to my second phase of field research in building towards consensus between the four SSCN constituents of my knowledge-community.

CHAPTER SIX

AN EMERGENT MODEL

6.0	INTRODUCTION	6-2
6.1	EMERGENT THEMES	6-3
	6.1.1 Performance models	6-5
	6.1.2 Performance indicators	6-6
	6.1.3 Use of methodology	6-10
6.2	POTENTIAL FOR A NETWORK PERFORMANCE MODEL	6-12
	6.2.1 Variables and comparability	6-13
	6.2.2 Emphasis of a network model	6-16
	6.2.2.1 <i>An equitable approach to funding</i>	6-17
	6.2.3 Common evaluation	6-19
	6.2.4 The influence of government	6-21
6.3	SUMMARY	6-23

CHAPTER SIX

AN EMERGENT MODEL

6.0 INTRODUCTION

In chapter five I presented the rich information gathered from my first round of telephone interviews, with a highly-experienced knowledge-community of senior science centre professionals. My analysis of this information illustrated the differences between centres and the funding and performance/accountability models which centres share with their respective governments. While many in my sample considered that science centres can play an important contributory role in helping fulfil governments growing interest in PES, views over their ability to influence policy around PES were more mixed. The contribution of key individuals in developing a centres relationships with government surfaced as a strong determinant of how productive this aspect of a relationship with government was likely to be.

The use of PIs across my knowledge-community was extensive but rarely in the form of a cohesive framework. The relative absence of outcome-based KPIs across my sample suggests much more work is required in this area. One of the major challenges to establishing robust, meaningful and transferable outcome-based KPIs, or indeed shared output measures, is the diversity within the science centre sector.

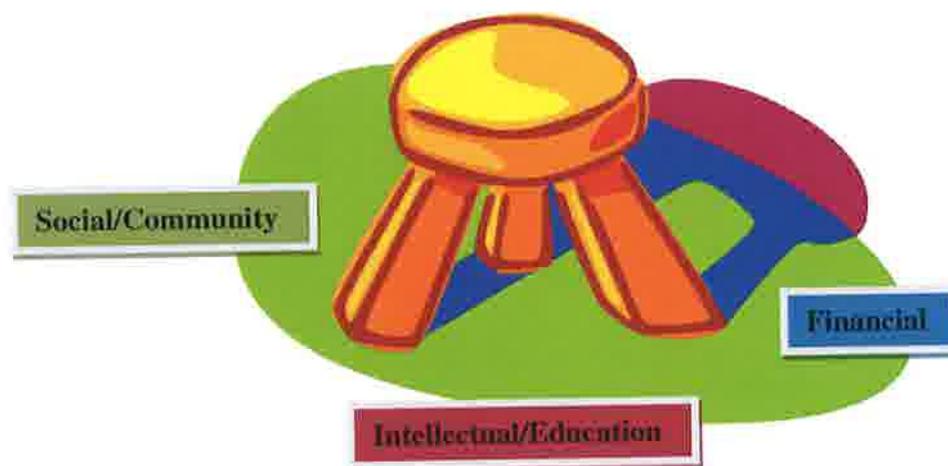
In widening my context from the experiences of individual interviewees to a potentially wider, network one, chapter six has two main parts. In part one, I more fully consider the convergent themes around performance models, associated indicators and the methodology around their application. In part two, I consider the potential for creating a

network-shared performance framework, the variables between centres, limits to securing consensus and effectiveness and the opportunity for network wide evaluation. The influence of government in advancing an effective network-wide performance framework is also considered. The outputs of this phase of my investigation established the legitimacy for attempting to create a consensus-based performance and accountability framework for adoption by the SSCN.

6.1 EMERGENT THEMES

Three main broad themes or categories of existing and desired PIs emerged out of my round one interviews: social, intellectual and financial. These are depicted in figure 6.1 and are represented in the form of a three legged stool in efforts to illustrate the importance interviewees placed on each theme being mutually supportive of the others. I shared these themes with my interviewees during my second round of interviews, with the majority of them agreeing that the main themes were broadly right.

Figure 6.1 Emergent themes from round one interviews



In briefly describing the model depicted in figure 6.1, social or community-rooted PIs were linked with the quantitative and qualitative outputs associated with running a science centre and included audience-related PIs, such as attendance levels, market share for each audience, the targeting of communities and the delivery of a quality experience linked to customer satisfaction, VFM and quality assurance. Surveys were identified as a potentially-beneficial way of capturing this information.

Intellectual or education-based indicators were those associated with the education and PES programming offered by science centres and included the range of public engagement/ education activities, responsiveness to handling contemporary scientific issues, cognitive effectiveness and intellectual accessibility. The desire by many interviewees here was to see the establishment of more robust outcome-based measures with which to better determine educational effectiveness. Alan Friedman, former chief executive of the New York Hall of Science, described the recent efforts (round two interview, 18/01/08) of the NSF in establishing impact-based KPIs for the science centre field:

We certainly can look at impact on visitors, what they actually learn, what their attitudes are. This has come a long way from just one-off studies with no comparability to the point today where the NSF will be announcing this year (2008) that it is requiring impact indicators for all of its funded projects. There is a list of impact categories and definitions and there is going to be a whole book which is going to be published any day now, which I've played a role in, on how to measure these impacts across different projects and how to make the measures comparable. [The book was published in March 2008 and is available as a PDF download at http://caise.insci.org/uploads/docs/Eval_Framework]. This publication is not going to say that's the only kind of evaluation or measure that you should make but it's going to say that every project has to at least have some measures that are comparable across institutions. This is for the Foundation's own benefit, so that it can make the case to its government funder as to why the government should continue to put

money in to this area, but it's also so that we can all learn across the field.

Interviewees described these PIs as the most difficult to measure effectively. They also felt that a KPI based on partnership was also important, for a small number sufficiently important to suggest a fourth leg be added to the diagram shown in figure 6.1. Lesley Lewis of OSC described (round two interview, 18/01/08) the importance of partnerships to her own institution:

I think there should be a KPI in the area of partnership. One of the traps that this organisation fell into in the late 1980s and 1990s was starting to be very insular and not reaching out to universities, corporations and research institutions. It's an area where we've made a very conscious effort in the past few years, to really change that pattern. I certainly see that becoming a differentiator. I think that it [partnership] could ultimately be a really important metric. It's like measuring the integration of the science centre into the local area.

Lastly, financial or business-related PIs, has already been considered in section 5.3.1 of chapter five. Interviewees felt these indicators were typically the easiest to measure and quantify. Additional suggestions under this category included the wider economic contribution of science centres to their local/regional economy, the efficiency with which the science centre is operated and the clear demonstration that the centre is working towards greater levels of financial sustainability. The emergence of this broad-based model and its approval by the majority of my interviewees was useful in beginning to think of the shape for an emergent performance framework.

6.1.1 Performance models

The emergence of categories of PIs, from my round one interviews, is of significance to my investigation in allowing me to develop my thoughts around what a possible

performance framework for adoption by the SSCN might look like. The emergence of these themes, in the relative absence of any other uniform thinking or practice around performance management frameworks, could additionally provide others with the starting point for constructing their own performance framework. While the emergent themes continued to emphasise an output-based approach to performance measurement they also clearly signpost the sector's aspiration to become more sophisticated in the establishment of measures which better point towards their effectiveness as venues for PES. The work of the NSF, previously described by Alan Friedman, has the potential to make an important contribution to advancing these efforts. While my own investigation has been concerned with the development of a model which the SSCN is comfortable adopting my interviews have identified a need for more work in further advancing outcome-based KPIs for adoption by the wider science centre sector.

6.1.2 Performance indicators

The range of PIs highlighted in both this chapter and chapter five are considerable and identified a range of possible KPIs for inclusion in any Scottish model. The work of Halcrow (2007) with the SSCN, described in chapter four, and subsequent interest by the Scottish Government in shifting its funding of the SSCN members from one based on need to one more informed by performance, has given particular recent emphasis to attendance-levels to the Scottish centres.

Given the Scottish Governments expressed interest in visitor numbers I was keen to establish whether my interviewees felt an emphasis on attendance levels, by government, was likely to have a positive, negative, or neutral effect on science centre behaviour. The majority of my interviewees saw no harm in governments emphasising

visitor numbers as a KPI and many recognised the value for politicians to be able to point to numbers as one of the headline returns for a funding relationship. While many saw the benefits, or at least accepted, an emphasis by government on visitor numbers to centres, interviewees were also typically keen to see other areas of performance profiled and not downgraded such as education outputs and outcomes. Emlyn Koster, chief executive of Liberty Science Centre commented (round two interview, 29/01/08):

The attendance culture is not a healthy one when looked at in isolation against all the other efficiency and outcome factors that our types of institutions should be focused on.

It was felt by several that a single emphasis on visitor numbers for a small network of science centres could introduce competition for visitors across the network and lead to compromises in quality of service delivery. This view was expressed (round two interview, 31/01/08) by GSC chief executive, Kirk Ramsay:

All you're doing [by emphasising visitor numbers] is creating a competition where there need be none and chasing numbers is not what we're about. There isn't a single example from anywhere in the world where this approach has met with success. It creates all of the wrong signals – in fact it would devalue the whole proposition of science centres, it would devalue the investment of the [Scottish] Government so far. I would describe it [the emphasis on numbers] intellectually bankrupt.

A number of other interviewees shared the views of Kirk Ramsay and felt that an emphasis on visitor numbers, by any government, was a negative indicator, to be avoided. In addition to increased competition across centres, the concern of many interviewees was that an emphasis on numbers would reduce centre's desire to engage in longer-term initiatives and activities targeted at hard-to-reach communities and instead place emphasis on existing users/visitors rather than asking who the non-users of

the centres are. The comments (round two interview, 29/01/08) of Graham Durant of Questacon reflect this:

In terms of whether it's [an emphasis on visitor numbers] negative or positive I think it's a bit of both. Clearly the negativity will come, if that is the measure then clearly you work to succeed and to do that, you work to get large numbers in, which means you become populist, which compromises your intellectual mission statement, because you're clearly not going to put on things that aren't going to attract significant numbers of people. In terms of where you do things, I mean for us, we can spend as much money going to a remote community where there are only 30 people as we could by putting on a programme in outer city Melbourne or Sydney, where there are millions, and you know, what is the better value for cost? Well, if it were numbers alone, you wouldn't go anywhere near the remote areas, and yet social disadvantage which is already extreme, would be increased, you won't be giving them those opportunities. You wouldn't be supporting the teachers who are pathetically grateful for any help because in many cases they are hundreds, if not thousands of kilometres away from folk. So it will distort the mission, just as financial performance can often distort you to a more commercial focus, and again, populist approach.

Despite these typically legitimate concerns the wider emphasis of interviewees was that they recognised government interest in visitor numbers but expressed a desire to see a balance struck against other, potentially more meaningful, performance indicators. Alan Friedman (round two interview, 18/01/08) expressed a view that:

Government should take it [visitor numbers] into account. I would be very fearful if it were the primary measure, or the only measure, or if it weren't used with a lot of thought. Here's a trade-off – you can have a goal of having a significant impact on visitors, in which case you want them to stay a long time so that they can become immersed in some activity – but this is going to reduce your visitor numbers.

Beyond visitor numbers government should have a more sophisticated formula that also looks at impact per visitor. A reviewer may decide that having double the impact on half the number of visitors is better than having more visitors and a lower impact on each visitor. Other things to look at may include the diversity of visitors.

As a function of Scottish Government interest, coupled with earlier recognition (see section 5.3.2, chapter five) of the need to identify network PIs with common language, definitions and collection methods, I was keen to establish how simple this might be using, arguably, one of the most easily-defined and measured KPIs: visitor numbers. In some ways expectedly, interviewees defined visitors slightly differently, a factor which had a consequential effect on the total number of visitors counted at each centre. The majority, however, counted visitors as anyone who had an interaction with the science centres exhibitions including leisure visitors, those on organised educational visits and anyone attending corporate events at the centre. Most also counted outreach visits and the number of virtual visitors to websites but recorded these separately. Others, who manufacture and tour travelling exhibitions, additionally count the number of visitors who have seen these exhibitions. Again, these numbers are typically recorded separately. In Scotland's case the visitor numbers currently recognised as countable by the Scottish Government includes leisure visitors and education-based visitors who had an interaction with each centre's exhibition but excludes corporate clients attending functions or events at the centres. This simple exercise demonstrates something of the difficulty likely to be encountered in reaching common definitions and collection/measurement techniques across the science centre sector or even the SSCN and why this detail of establishing a new framework was always anticipated to take place after securing the main aim of my investigation.

Sticking with visitor numbers briefly, I also asked interviewees whether different categories of visitor should be considered in any visitor-orientated KPI. Several categories were identified including, general public, groups (non-school), educational groups (schools and pre-school) and in-reach versus outreach. My interviewees also

considered the demographic profile of visitors was important in determining the centres social reach, market-share for major categories and visitor profiling by programming area. Other KPIs, e.g. effectiveness in targeting community groups, customer satisfaction and VFM, have previously been identified, albeit briefly, and would form the basis for a dialogue with the SSCN centres in the second and final phase of my field research.

6.1.3 Use of methodology

Having previously touched on the frequencies of reporting performance to government, in section 5.2.1.2 of chapter five, I was keen to establish how regularly my interviewees felt performance *should* be reported. The majority felt that annual reporting to government should be sufficient but additionally recognised that this was dependent on which indicators were being reported against. Several suggested more regular reporting although the centres who recommended this were already collating reports for internal management processes. Whilst it is potentially feasible to report regularly against output-based, quantitative, performance indicators, any attempt at reporting against either qualitative outputs or the harder to measure outcome-based measures would likely take longer based on the difficulty of harvesting and interpreting performance outcome related data. The frequency recommended by interviewees was typically annual and for outcomes potentially tied in with the contract period between science centres and their governments. When linked with funding-term reporting, interviewees suggested the additional input of independent, external, review.

Returning to individual KPIs, I was keen to establish whether interviewees felt this could be meaningfully done by considering a single level of indicator or whether

multiple levels would be necessary? Most of my interviewees felt that more than a single level of reporting was required in order to develop a clear picture of performance but that the number of levels of measurement and associated reporting should be determined by how meaningful the resulting data was. This view was expressed by Stuart Monro, scientific director for ODE during second round interviews (28/01/08):

There is a balance to be struck. You can drill down through your analysis to your hearts content – the question is how productive will that drilling down be in the long-term, to what extent will it contribute to you doing your baseline work better?

For numerical or quantitative KPIs the level of reporting required was anticipated to be relatively simple compared with either qualitative or impact-orientated measures. There was also a view expressed that reaching below KPIs would be essential in any attempt at reaching comparability between the four very different SSCN centres. Conversely, one interviewee held the view that good PIs are often composite of several indicators when attempting to describe the full picture of performance. Despite only being voiced by one of my interviewees this approach rings true of the balanced-scorecard approach which other interviewees did highlight in other parts of my interviews.

In considering the development and administration of an outcome-based approach to performance management, I was keen to try and establish whether it was feasible to demonstrate/measure public engagement, attitudinal change or learning during (or after) a science centre visit. Many of my interviewees responded positively, citing specific research which they felt supported this. Attitudinal change was viewed as the easiest of the three areas to measure albeit reliability issues associated with this type of research were seen as problematic. A current emphasis on measuring single impacts or impacts

associated with specific projects, while useful, were not viewed as going far enough. Several interviewees, including Questacon's Graham Durant, called for more longitudinal research into science centre impacts and the harvesting of anecdotal evidence in efforts to triangulate data and improve the reliability of future research.

Several of my interviewees including Sally Montgomery, chief executive of W5 in Belfast, Peter Trevitt, chief executive of Techniquet in Cardiff and Goery Delacote, chief executive of @t-Bristol expressed interest in deep learning following a science centre visit and which could present itself months or even years after the science centre experience. The difficulty of capturing this type of impact or 'slow-burn' effect was previously highlighted in section 2.2.3 of chapter two.

6.2 POTENTIAL FOR A NETWORK PERFORMANCE MODEL

Based on the relative absence of common performance frameworks for networks of science centres, I was keen to secure the views of my knowledge-community, in terms of whether potential for developing a common framework for a small network of science centres existed. While mixed in their responses over half of my interviewees (fifteen) felt this should be possible. One interviewee, Alan Brien of Scitech, gave an example (round two interview, 04/02/08) of the Council of Australian Museum Directors where a similar model already existed:

It's a fairly diverse group but we're (Scitech) in it right through to the Australian Museum, the Powerhouse Museum, the Australian National Museum, Melbourne Museum, South Australian Museum and the West Australian Museum – all, in traditional terms, your classic 100 year plus institutions called museums – we're in it and Questacon are in it. We're in it for two reasons, first is we want to rent our exhibitions to some of the big players and second we want access to the data they collect. So on an annual basis they do a detailed survey of operating costs, visitors, so you can try to compare a visitor that comes here to a visitor that goes to

the Powerhouse Museum. So we all collect and record the same data. We then provide that data to the head office annually and then they come back and publish all of the results of all of that data- in terms of head count, revenue count, number of full-time equivalent (FTE) employees, all that base data is there and examined by the twenty members in the group, so yes it is possible, it does take a lot of work but we see it as really really valuable.

Given this Australian example several interviewees who felt a common framework was unrealisable did concede to the potential for developing common elements or a common core of KPIs. Several factors were identified for which mitigating factors would have to be identified, if any effort to realise an effective common framework were to be advanced to successful implementation. These were that common frameworks within science centres are not well tried and tested - the coordination of any resulting framework, across centres, would likely prove challenging; the many variables between the different science centres which would have to be moderated for in efforts to achieve a level of relativity to performance between centres; and methods of external evaluation typically employed are often weak and undertaken by individuals who have little knowledge of the sector. Many of my interviewees were in favour of incorporating an external peer-review element to any external evaluation. Subject to overcoming these, and other likely, issues during the development of a common performance framework for the SSCN, interviewees expressed the view that the resultant framework should illustrate how effectively the network is delivering against government objectives. These comments mirror those made by Chris Smith in section 2.3 of chapter two.

6.2.1 Variables and comparability

The major variables identified by my interviewees, between different science centres, were size/scale, exhibition theme e.g. life sciences, other signs of capital investment e.g.

IMAX theatre, audience – in terms of profile but also including catchment, geography and location, visitor numbers and financial indicators. Other important differences identified included the science centre's history/experience, differences in government structures between countries and the philosophical approach adopted by different centres to the role of being a science centre. This final point is perhaps best illustrated in terms of the differences in mission, vision, aims and objectives of different science centres. This list highlights the likely difficulty in identifying common performance indicators, for which comparability between science centres is possible. Even in the case of Scotland's four centres the majority of these variables are in evidence and raise an important question as to whether centres should be compared with each other, against themselves or against others, outwith the SSCN, but of comparable size, theme, audience, etc.

The likely difficulty of securing comparability between centres led me to asking my interviewees whether they could identify any KPIs for which comparability across different science centres might be possible. All of the responses offered by interviewees were based on output measures only, typically those associated with the visitor, e.g. visitor numbers, or with the visitor experience, e.g. quality, customer satisfaction. One interviewee suggested any quantitative measure should provide a crude comparable measure. Many of my interviewees suggested the use of ratios. These typically fell into one of two categories, cost data ratios and visitor ratios. Suggested ratios associated with cost included cost/per visitor, cost/FTE, cost/square foot of exhibition space and those associated with visitors e.g. visitors/FTE, visitors/square foot of exhibition space and income unearned/visitor.

While fairly unimaginative in themselves it was the wider comments made by interviewees around comparability which resonated most strongly. One interviewee suggested, as above, a need to identify comparators elsewhere and outside the SSCN. Others suggested the focus should be on identifying indicators which deliver what is needed, rather than emphasising issues such as comparability, particularly when this might drive the outputs of centres in potentially compromising directions, e.g. an emphasis on comparing visitor numbers between science centres which detracts from, arguably, the more important activities of science centres associated with advancing PES and education in each centre.

Pursuing this last point, I asked my interviewees if they could identify KPIs, for which comparability with other science centres would be difficult but which should be expressed in any performance framework anyway. The major theme identified by interviewees was of measuring impact, in efforts to demonstrate that learning had taken place either during or following the science centre visit. The varied nature of science centre exhibitory, programming, content and approach are such that this could only be considered on an individual basis. Several interviewees also felt that resource related differences, e.g. finances and physical assets, could only be considered individually. The relative scale of centres, commonly associated with resource levels, would make comparison of efficiency-based indicators difficult and in all likelihood meaningless. The local/regional dynamics in which the science centre operated were also considered very individual but important in considering factors, such as population base, differences in community need from a science centre, and the individual relationships and stakeholder groups which different science centres have developed. Collectively, an

understanding of these factors describes the context of each science centre, a key factor in developing a robust, and essentially meaningful, performance framework.

6.2.2 Emphasis of a network model

The previously-expressed views around the potential for developing a shared performance framework in which comparability features, drew mixed responses from interviewees. The individual nature of every science centre is such that comparability in all aspects of performance would be largely meaningless. Given the differences in views within my knowledge-community, I was keen to establish whether my interviewees felt a performance framework for a network of science centres should be exclusively network-based, individual or a combination of both in focus. Perhaps unsurprisingly, given earlier comments most of my interviewees felt a framework which considered both network and individual performance indicators made most sense. At the risk of repeating earlier comments my interviewees highlighted several factors for further consideration. These included that a network performance framework should have a core of common indicators but additionally give each centre the flexibility to focus on their own performance – some indicators are comparable between different centres while others are not and potential indicators should not be ruled out for that reason. One of the major strengths of science centres is that they are different and this fact should not be lost in discussions with the government.

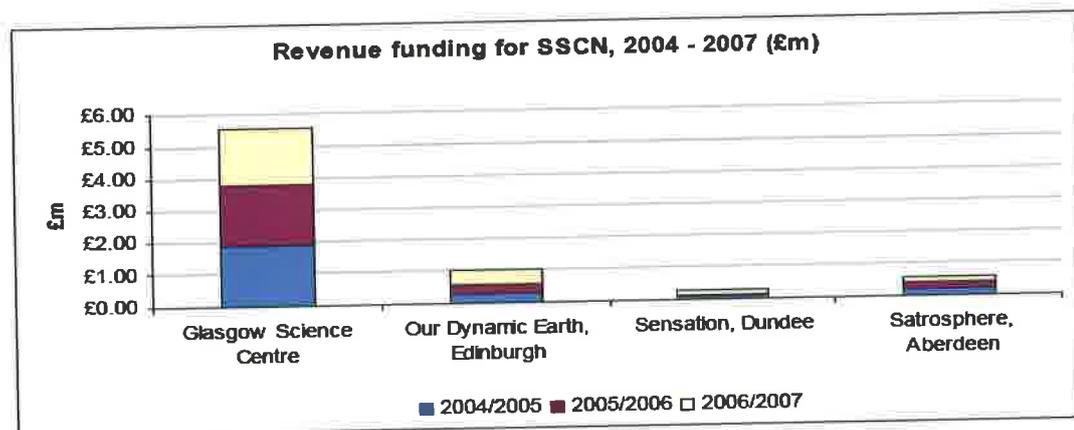
A small number of interviewees felt that a performance framework for the SSCN should focus on individual performance only. Comments in support of this position included the need for science centres to be measured individually for their own competence and collectively on joint projects/initiatives. In the specific example of Scotland, the four

science centres should be measured individually because they are at different stages in their development. The significance of individual centre context should not be lost when a broader view is taken. A lone interviewee additionally made the point that in some ways a performance framework that has an aspiration to deliver more strongly for Scotland should actually be wider than the network. That science centres have a contributory role to play in advancing PES has previously been claimed and there is merit in a future effort to bring other key players together in a national, not just network approach.

6.2.2.1 An equitable approach to funding

Tied in with the history of the SSCN has been an approach by the Scottish Government of funding centres on the basis of need. Over the three years between 2004-05 and 2006-07 the Government funding allocated to the SSCN amounted to a total of £10.4m. Over 70% of this expenditure-related to revenue support, and the remainder related to capital expenditure (18%) and education-related projects (11%). Figure 6.2 illustrates the distribution of revenue funding across the SSCN.

Figure 6.2 Revenue funding for SSCN, 2004 - 2007



Source: Scottish Government (2007)

Over the three years, three quarters of the revenue funding support was provided to GSC, amounting to nearly £5.6m with only 4% (£263k) to DSC. This method of distribution saw centres striving to run an efficient operation being unfairly penalised and those with the largest operating deficit rewarded. The Halcrow report (2007) recommended that the Government move away from this approach to a fairer one based on performance, as described in section 4.5 of chapter four.

With the prospect of a new funding mechanism looming I was keen to capture the views of my knowledge-community over whether they felt it was possible to be equitable in distributing funds across more than one centre, and if so, how this might best be achieved. Many felt that it should be possible for government to be equitable in its distribution of public funding but that context e.g. asset base, size, need, mission, etc, remained an important determinant. Several suggestions for overcoming context were made and included that funding should be distributed on a semi-competitive basis, potentially peer reviewed; the establishment of a ‘funding formula’, in essence an assessment framework against which to determine performance; that centres be funded for what they do – potentially under the terms of a service contract; for funding to be distributed through a mix of core and project-based methods; and using visitor numbers as the basis of distributing funding.

That this last point resonates with the newly-adopted position of the Scottish Government, is the basis of one of Halcrow’s (2007) recommendations, and was highlighted by several of my interviewees is of note. Several interviewees also reinforced the need for science centres to work at building communication with

government and, importantly, at building relationships during the periods of review and subsequent change.

6.2.3 Common evaluation

In drawing to the close of my second round of interviews I asked interviewees whether or not they were able to identify common areas of activity between science centres, where a common evaluation of KPIs might be possible. The major responses clustered on the activity base of science centres and their intended learning outcomes/outputs. While common areas of activity might initially be difficult to identify, interviewees felt this was important in conducting a meaningful evaluation. One suggestion was the focussing of this type of evaluation on potentially pan-network projects. Several highlighted the need for standardisation of the evaluation process, possibly aided by adoption of measures currently employed by the museums sector, such as the GLOs model or the more widely-used ‘Pledge to Learners’, a quality assurance framework which effectively acts as an education-based checklist.

In broader terms the two SSCN reviews conducted by HMIE in 2002 and 2006 were additionally cited as positive examples of common evaluation, the outputs of which have led to the development of educational standards across SSCN member centres. That the HMIE reviews led to recommendations and subsequent improvement was a factor which many felt was important from any evaluative process. The opportunity for evaluation to regularly inform strategy and evidence-based decision-making were viewed by several of my interviewees as an important part of the process.

In addition to informing the approach and development processes of the science centre one interviewee also suggested that this information should also inform the attitudes of

government towards their relationship with the science centres. In all of the above, interviewees consistently expressed the view that the evaluation process should clearly be a beneficial one and that any associated reporting should be circulated to the science centres involved in the process and to their funders. Interviewees had more mixed views, in terms of the wider distribution of these reports, with varied policies on the dissemination of review materials being expressed.

Perhaps more importantly than the final evaluation report itself is the correct selection of individuals/organisations to conduct the types of review, which in Scotland's recent history have been conducted by Jura Consultants, Halcrow Group Limited and HMIE. None of these organisations had had any prior experience of working with science centres before conducting their initial reviews. Based on this personal experience I was keen to ask others their views on who was best placed to conduct an intelligent evaluation/interpretation of any KPIs for science centres. Knowledge of the sector was highlighted as the number one qualification, ranking more importantly than *who* should be conducting these types of review. In terms of *who*, interviewees suggested peer review - someone internal or external but who is recognised as intelligent by the field; someone externally – who knows science centres; Associations e.g. ASTC, should be contributing; and Independent consultants who know the sector. More broadly it was suggested that choice of reviewer should depend on the measures under consideration - core experience should be evaluated by people who understand the nature of the experience. In this scenario a full evaluation would involve different reviewers. The potential for this approach was described by Stuart Monro (round two interview 28/01/08):

I don't think we've got a single body that can evaluate all of the KPIs across the board. From the science and education point of view you give to HMIE that which it is good at – it may not be that good at evaluating the contemporary science that we're presenting so I think we need our own stakeholders, who are the cutting-edge scientists who are keen on communicating that and who can come in in the same sort of way that HMIE advised on how we're actually communicating our science. I daresay there'll be others who'll have much more of a business perspective. There is also the other element of peer monitoring. Within each of our centres we've got people who've got expertise in each of these particular areas.

Of these suggestions, peer review featured most prominently and has the potential to encompass several of the other points, albeit peer review was not specifically mentioned in relation to them. The consensus around peer review was for a small group of senior science centre professionals, potentially drawn from different countries, to be brought together. One interviewee suggested a representative of government should also be included. This point was re-enforced by another interviewee who suggested the civil servants who work with science centres should visit them more often in order to better understand what really happens and what they should be looking for.

6.2.4 The influence of government

Based on the experience of members of my knowledge-community, many of the relationships which science centres have with their government, and notably the nature of these relationships, has been set by government and not the science centre. Clearly in the interest of the science centre to develop a dialogue with government, particularly with regard a performance framework, I asked my interviewees what role, if any, government should play in setting and/or agreeing PIs. Almost all agreed that government should play a role but most felt that it should agree rather than set the indicators.

In describing the US model, Kim Cavendish, president and chief executive of the Museum of Discovery and Science in Fort Lauderdale (round one interview, 30/11/07) offered:

Here [the US] the government isn't so much setting performance indicators when it funds something. It's generally more that they're saying to the science center, "we want you to show us what your goals are, how you're going to meet them and what your evaluation method is going to be". Then they either buy into that and fund you or they don't buy into it and they don't fund you.

Per Edvin Persson suggested (round one interview, 25/10/07) more general advice when negotiating with government sponsors:

If you are going to use some performance indicators, I guess you have to agree with whoever is going to use them. In that sense there has to be some form of discussion but I would always say that it is better if the [science centre] field itself puts in place some indicators and then presents them to the government and says look this is what we are doing in the field, so you can use this information.

A few felt government should play a role in setting indicators. One interviewee felt that government should only play a role in influencing the specific programmes and activities which they are funding. These points link with earlier comments of one interviewee about the need for more civil servants to better understand what happens in the science centre. One interviewee made the important point that it is government's role to set out and agree 'policy' and that the role of the science centre should be to link with policy and show the connections. That a need for an iterative dialogue between centres and government exists in this important process seems evident.

Whether agreeing, setting or jointly developing the KPIs for science centres, I was keen to establish what significance government should place against delivery or non-delivery

of these. This issue will be a major one for the SSCN in its move from a need-based funding policy to a performance related one. The general view of interviewees was that science centres should be penalised when failing to deliver agreed performance but only once factors outwith the control of the science centre had been accounted for. Lesley Lewis, of the OSC, highlighted the specific example of a breakout of Severe Acute Respiratory Syndrome in Canada which had had a significant and detrimental effect on attendance levels at OSC and over which they had no influence. Science centres are also prone to seasonal fluctuations in performance and at least two interviewees suggested that under-performance over the long-term should be given greater significance by government.

6.3 SUMMARY

Chapter six has highlighted the potential for creating a common performance framework, for implementation across the SSCN. The relative absence of this type of framework within the science centre field, coupled with the diversity of SSCN membership provided further re-enforcement for the need to carefully construct the new framework with the input of all SSCN centres.

The nature of the SSCN is such that the early emphasis of identified KPIs was output-orientated but recognised an aspiration of becoming more outcome or impact orientated. While the balance of the new framework is in favour of individual performance, there are wider KPIs for which some comparability exists. Moreover, the new and shared framework supports the Scottish Governments expressed intention of moving away from a needs-based approach to an arguably fairer, and more equitable, one based on the performance of SSCN centres.

The significant volume of information which I was able to gather during two rounds of detailed questioning of an international and respected knowledge-community provided a significant evidence base with which to develop the final phase of my investigation. The diversity of approaches accommodated by my sample in relation to current international practice is contrasted by the often similar views expressed for an aspirational model. These responses lifted beyond the constraints of specific circumstances and provided several strong lines of early consensus around key themes which were shared with my SSCN stakeholders in the final phases of my investigation. These final phases are described in chapter seven.

CHAPTER SEVEN

CONSENSUS BUILDING ON THE NEW MODEL

7.0	INTRODUCTION	7-2
7.1	THE SCOTTISH GOVERNMENT AND OPERATIONAL FUNDING 2008-11	7-3
7.1.1	Performance measures and key performance indicators identified by the Scottish Government	7-6
7.2	REACTIONS OF THE SCOTTISH SCIENCE CENTRES TO RESEARCH SO FAR	7-9
7.2.1	Doctorate update	7-10
7.2.1.1	<i>Defining a 'paying visitor'</i>	7-13
7.2.2	An emerging model	7-14
7.2.3	Advancing a common methodology	7-15
7.3	REFLECTING THE CHANGING ENVIRONMENT	7-16
7.4	ADVANCING THE KEY PERFORMANCE INDICATORS	7-21
7.5	SECURING CONSENSUS OVER A NEW SSCN PERFORMANCE FRAMEWORK	7-23
7.6	SUMMARY	7-27

CHAPTER SEVEN

CONSENSUS BUILDING ON THE NEW MODEL

7.0 INTRODUCTION

In chapter six I highlighted the emergence of an early performance model from two rounds of telephone interviews. The KPIs identified through this process were grouped around the broad themes of *social/community*, *intellectual/educational* and *financial*. The lack of consensus over the usefulness, definition and frequency of collection/measurement of identified KPIs meant that what emerged was a loose model requiring further development in order to make it a coherent and cogent performance and accountability framework. The predominance of quantitative indicators over more qualitative or impact related indicators was also noted. The relative absence of any *joined-up* thinking over the application of PIs across so many science centres was a surprise output of the interview phase of my investigation. That there is such diversity both in the sector but also in the relationships between science centres and their governments was also highlighted.

In advancing development of this early model into a framework for adoption by the SSCN, I consider chapter seven in five parts. Part one considers the announcement by the Scottish Government of a new three-year round of funding for the SSCN. This contained a new basis for distribution of funds across the SSCN and an accompanying set of conditions, including that the SSCN develop a performance measurement framework that better demonstrated VFM and the achievement of performance outcomes. I capture this development early in chapter seven as it influenced the outputs of this important development phase of my research. Part two highlights the reaction of

SSCN members to my early interview-based research and the identification of key themes. This was the focus of my meeting of the five SSCN participants in my investigation, myself, John Simpson (chief executive, ODE), Stuart Monro (scientific director, ODE), Kirk Ramsay (chief executive, GSC) and Robin Hoyle (scientific director, GSC), when we met on the 26th February 2008. This meeting failed to advance much beyond a consideration of the early research-based model because of the implications of the new funding model proposed by the Scottish Government. Following this meeting, as described in part three, I developed an early research-based model with a consideration of the Scottish Government's new expectations and the reactions of SSCN participants to my initial research and key themes. Part four reflects the second meeting of the SSCN participants on 20th March 2008 and reviews the discussion held at that meeting around KPIs and associated successes around moving beyond the continuing disagreement over funding mechanism. Part four also captures subsequent discussions between the SSCN chief executives in my efforts to secure consensus around a new framework. In part five, I present the final model, agreed by the SSCN, before concluding chapter seven with a brief summary of the evaluation phase of my research.

7.1 THE SCOTTISH GOVERNMENT AND OPERATIONAL FUNDING 2008-11

In her letter to the chairs of the SSCN centres in December 2007, Scotland's Chief Scientific Advisor, Professor Anne Glover, announced the continuation of Scottish Government funding for the SSCN centres for the period 1st April 2008 to 31st March 2011. Professor Glover set out the following key features of the Government's

continuing support in the context of Scottish ministers' desire to see public funding driven by VFM and the achievement of performance outcomes:

Funding will continue to be offered on a discretionary basis; science centres are free to accept or decline the offer of funding and its associated conditions. Funding will be offered on a 36-month basis, to assist business planning and remove the need for annual negotiations. Funding will shift to an outcome-driven formula based on share of network visitors to reflect Scottish Ministers' aims. This shift will be phased over the next two years in a stepped transition, such that by 2010-11 funding will be offered 100% on the basis of share of network visitors. Up to £2.43m will be offered across the network for each of the next three financial years. Network targets for visitor numbers will be set, to help ensure that all the science centres are working to a common goal in this area. Funding will shift to quarterly payments in arrears, according to actual performance in the preceding quarter. Following a recommendation by HMIE, a further £126,000 will be available annually across the network as a transport subsidy to enable visits to the science centres by particular school and community groups. Finally, I will expect the network to develop consistent qualitative and quantitative performance measures, in discussion with members of my team.

In concluding her letter Professor Glover also highlighted Scottish ministers' desires to see a balance of commercial and science engagement activity at each centre in efforts to ensure a high quality of science engagement experience for visitors, while at the same time reducing the reliance of centres on public funding. Further detail of the offer to centres was subsequently set out to the SSCN chief executives by the director of OCSA's, Science and Society Division, Dr. Isabel Bruce (see appendix 12). While too detailed to describe fully here, this letter set out a summary of the new funding package, as previously described by Professor Glover in her letter to the SSCN chairs, the expectations of the Scottish Government in return for continued funding and a short background to explain the basis of the Government's thinking around this new approach. The principles behind the new funding package were influenced by the SSCN strategy and the earlier reviews of the SSCN by Halcrow Group Limited (2007) and

HMIE (2006). In describing the overall emphasis of the new strategy Dr. Bruce highlighted:

The ultimate strategic outcome driving Scottish Government funding of the SSCN is achievement of a 'Smarter Scotland' (<http://www.scotland.gov.uk/About/scotPerforms/objectives> [Accessed 1st May 2008]). The new funding package is in acknowledgement of the important part that the SSCN plays in helping to achieve this. In return for this funding, the Scottish Government is setting out the things it expects the centres to individually and/or collectively achieve as their contribution to achieving 'Smarter Scotland'. These are defined by way of a number of supporting strategic short-term outputs and long-term outcomes. Progress in achieving these will be measured through a SMART reporting framework incorporating KPIs, performance measures and time-related targets.

Four main strategic objectives were set out by Dr. Bruce. First, to attract the following total network paying visitors each year – the network defined as The Science Mall at GSC, (and including the Planetarium), ODE, Satrosphere and DSC (see table 7.1).

Table 7.1 Annual network visitor target

	2008-09	2009-10	2010-11
Network paying visitors	600,000	625,000	650,000

Second, to provide an inspiring, accessible and high quality focus for informal science education and engagement for Scots of all ages in Scotland's four largest cities. Third, to complement the formal education science curriculum and promote science careers to young people, helping to ensure a future supply of scientists. Fourth, to provide opportunities for Scottish HEI, Research institutes, industry and business to showcase new scientific research, products and processes, highlighting the excellence of Scottish science and innovation, and the relevance and importance of science to the Scottish economy. Given the repeated emphasis on demonstrating VFM a fifth strategic

objective, not identified by Dr. Bruce, could sensibly be to demonstrate VFM for all public investment.

7.1.1 Performance measures and key performance indicators identified by the Scottish Government

Having detailed both context and expectation for future Scottish Government investment in the SSCN, Dr. Bruce outlined a number of outputs and outcomes expected as part of any new performance framework. While detailed in appendix twelve, in headline these were divided into short-term outputs and long-term outputs (see table 7.2).

Table 7.2 Short-term outputs and long-term outcomes of the Scottish Government

Short-term outcomes	Network paying visitors	Number of paying visitors to the centre and the Network; Number of paying visitors by socio-economic group, age, provenance and nature of groups (e.g. friends, family, extended family), based on visitor profile information collected by periodic surveys.
	Visitor Satisfaction	Satisfaction rating by paying visitor to the overall centre visit experience;
		Satisfaction rating by paying visitor for the individual components of the centre visit, including: visitor reception and ticketing; café; retail; toilets; permanent exhibition; temporary exhibitions; parking and access.
VisitScotland rating (the VisitScotland Quality Assurance scheme for Scottish Visitor Attractions)	Maintain a minimum of four-star status.	

	Sound science	Quality standards to consider processes, intermediate outputs and final outputs.
	HMIE inspection recommendations	Measure(s) of the extent to which implementation of proposals and projects tracks through to achievement of other outputs and outcomes.
	Links to Curriculum for Excellence (the new Scottish School's curriculum)	
	Showcasing contemporary science	
Long-term outcomes	Awareness of science centres	
	Science culture	<p>KPIs may include:</p> <ul style="list-style-type: none"> • Measure of changes in behaviour; • Measures of changes in attitude; • Number of repeat visits to the centre.
	Uptake of science education and careers	

The range of KPIs identified by the Scottish Government is extensive. Their separation into short-term and longer-term measures reflects the Government's recognition that much of the current knowledge base around science centre performance is output-based and typically quantitative. Future expectation, however, is that the SSCN becomes more sophisticated in its measurement of more qualitative outcomes in efforts to better demonstrate future impacts. That this reflects the international situation currently demonstrates something of the aspirations of the Scottish Government for the SSCN in advancing its effectiveness. In demonstrating its eagerness to advance development and adoption of a shared performance framework by the SSCN it asked its members to respond by a short deadline. These are reflected in table 7.3.

Table 7.3 Deadlines for responding to Scottish Government request for information

Task	Action	Deadline
Agree final definition of a 'paying visitor'.	SSCN	31 st March 2008
Submit agreed proposal distribution of annual £126k transport subsidy, based on its experience from the previous pilot.	SSCN	31 st March 2008
Develop a common performance management framework to include developed KPIs, performance measures, targets and associated monitoring and performance mechanisms.	SSCN	For implementation by 30 th September 2008 (with interim progress summary to be submitted by 16 th June 2008)
Submit a one year detailed science engagement proposal for 2008/09 which sets out plans for delivering/contributing to achieving the Government's strategic outputs and outcomes associated with 'Smarter Scotland'. Centres should draw on SSCN performance framework developments as much as they are able to.	Each centre	31 st March 2008
Submit a wider three year strategic proposal which encompasses the period 2008/09 but which sets out longer term delivery plans in contributing to and achieving government strategic outputs and outcomes through to 2011.	Each centre	30 th September 2008
Submit detailed annual proposal which reflects the three year strategic proposal described above.	Each centre	31 st March 2009 31 st March 2010

Having written to the SSCN chief executives on the 1st February 2008, with several deadlines set at 31st March 2008, the Scottish Government gave the SSCN little time in which to develop a collective and strategic response. Having already scheduled a meeting of my five SSCN study participants, for the 26th February 2008, to discuss an almost mirrored development, the opportunity to dovetail my research with the needs of the SSCN, as directed by the Scottish Government, seemed a highly productive and

meaningful approach, particularly as my own research was at such an advanced stage. There seemed little point in securing consensus over a refined performance framework amongst the SSCN exclusively if this was found to be in contrast to the expressed views of its primary funder.

7.2 REACTIONS OF THE SCOTTISH SCIENCE CENTRES TO RESEARCH SO FAR

In efforts to secure maximum benefit from my first joint meeting with the five SSCN study participants, I was keen to present and secure feedback over the emergent thinking and early KPIs that had surfaced out of my two rounds of telephone interviews. Given the timing of the Scottish Government's call for proposals, as described above, I was also keen to secure agreement over the dovetailing of my research with the expectations of the Scottish Government in returning SSCN feedback to the government by its requested deadlines. The full minutes of this meeting are recorded in appendix 13.

In addition to discussing the development of a new SSCN performance framework, the Scottish Government had also offered the SSCN £126k towards subsidising school travel costs. While this matter is not directly related to my investigation, and so will not be covered in any depth, that there was disagreement during the meeting over the distribution of these funds across the SSCN, ultimately with no agreement being reached, is of significance. The failure of the SSCN to reach consensus over a relatively minor funding-related decision, when set against a context of the Government's announcement of a new landscape of funding the SSCN, was an early concern. The main agenda items covered during the meeting were an update on my research; an emerging model; and advancing a common methodology.

Much of the meeting focussed on the emerging model and specifically the implications for the SSCN of a new funding arrangement based on share of network visitor numbers to each centre.

Having circulated the agenda before the meeting, I opened it by suggesting a number of key outputs. These included the need to agree feedback to the Scottish Government and by when; to identify headline KPIs; to establish the definition of a ‘paying visitor’; and to discuss the share of transport subsidy, which I have already covered in sufficient detail. Limited but useful progress was made against these desired outputs from the meeting.

7.2.1 Doctorate update

In updating SSCN participants of my progress I began with a brief overview of my research process and notably in terms of the range of inputs from my assembled knowledge-community. I also informed everyone that no sophisticated performance frameworks had emerged from my research and where better examples did exist these were typically labour and resource intensive from a collection, evaluative and reporting perspective. During these opening remarks I also advised that any model should agree with the Scottish Government’s expressed ambitions for the SSCN but preferentially not be set by them. At this stage of the meeting I tabled the first of two papers, titled ‘Early Observations and KPIs which had emerged out of the interviews’ (see appendix 14). This paper identified the main themes and observations, along with some suggested KPIs to have emerged from my interviews. The initial observations identified were:

- 1) A common framework needn’t mean comparing centres with each other;

- 2) A performance framework which strikes a balance between network and individual KPIs was favoured;
- 3) Any framework should be simple, visitor-focussed, SMART, impact-orientated, value/quality-driven, learning-based, statistically-based;
- 4) Visitor numbers as an emphasis was not a problem for most as long as things like quality, investment in needy communities, content and dwell-time were not compromised. In this regard it is maybe unsurprising that several favoured a balanced-scorecard approach;
- 5) Some recognised that a focus on numbers could introduce competition into the network. Some saw this as a positive; most who highlighted it saw it as a negative;
- 6) Comparability typically referred to in terms of education-related activities;
- 7) Some differences of opinion over whether or not there should be more than one level of indicator. It was usefully suggested that any more than one level should only 'drill-down' as far as is meaningful;
- 8) General view that the total number of KPIs should be kept to manageable levels (ranges between 5 and 10 most cited);
- 9) Any framework should be driven by the needs/wants of the customer i.e. the Scottish Government;
- 10) Strong support for peer review.

In running through each observation with the assembled group, greater focus was given to certain observations (1-5,9,10) over others (6-8) and simply reflected a natural flow of the discussion. This was also reflected in the fact that a consideration of the observations did not flow in the linear fashion presented above. In efforts to effectively chair the meeting I was much more interested in securing the outputs identified at the outset of the meeting than managing a sequential dialogue.

Based on the very different nature of the four SSCN centres it was agreed that a one-size-fits-all model, in which centres are compared with each other across all indicators was not appropriate. The group concurred with the majority of interviewees in

expressing the view that the differences between centres should be recognised as a strength of the network. It was also agreed that other comparator centres do exist for each centre in the SSCN but that these will lie out-with Scotland.

In considering whether a performance framework should be all about a network or an individual approach there was a discussion around what the SSCN actually was. Participants had differing views over this and the lack of any consensus points to a future challenge of the network in how it jointly moves forward in its new funding relationship with the Scottish Government and ultimately whether it is viewed as a success or not. This discussion was not concluded.

Turning to the principles around the KPIs themselves it was agreed that any SSCN framework should be kept simple with a relatively low number of KPIs. The number of levels of indicator under each KPI should reflect the complexity of the area being considered e.g. education could not be addressed by employing a single KPI. While these general principles were agreed, the major challenge identified mirrored my interviews in raising how to evaluate impact either during or following a science centre visit. That the UK's museums and libraries sector are also impact-orientated was highlighted in terms of them possibly having indicators that the SSCN might evaluate and adopt. It was also agreed that under certain circumstances, as identified by my research, the harvesting of anecdotal indicators of impact could be useful.

Based on the current predominance of quantitative or output-related KPIs, the group discussed the potential for adopting a balanced-score card approach in efforts to ensure that the effectiveness of the SSCN was not compromised at the expense of efficiency and economy. Partly reflected in the Venn diagram that emerged out of the round one

interviews (see figure 6.1, section 6.1) it was agreed that this would be a sensible approach albeit one requiring a maturity of thinking across the SSCN and a genuine sharing of information between SSCN centres.

7.2.1.1 Defining a 'paying visitor'

In considering the potential of visitor numbers becoming the emphasis of funding the group had very mixed views. While three of the centres (DSC, ODE and Satrosphere) were comfortable with the prospect of the government shifting its emphasis to funding the SSCN centres by share of network numbers, GSC was not. Six areas of concern were expressed by GSC. The first concern was that funding centres in relation to share of visitor numbers would drive a wedge between SSCN centres and create a competitive environment between them. The second area of concern related to the current focus by centres on widening audience away from a predominantly white, middle-class visitor to one given over to simply driving visitor volume. The third area was that a shift in focus to 'easy wins' would be detrimental in the long-term for the public engagement with science. The fourth area was that a downward shift in funding for GSC associated with the proposed approach would likely result in an annual loss of visitors to GSC of around 80-100k a year. The fifth concern was that placing single emphasis on a single KPI that has external variables which influence it heavily e.g. weather, carries a high risk factor. Finally there were concerns that quality would be compromised by a quantitative-based driver of funding.

While reflecting the general mood of my wider knowledge-community, in highlighting these concerns, subsequent attempts to try and reach agreement over a unified definition

of a ‘paying visitor’ proved difficult. Based on my research I offered the following definition:

All visitors gaining ticketed entry in order to gain admission to the main exhibition area of each centre including leisure visitors and those visiting in organised education groups.

While DSC, ODE and Satrosphere were agreeable to this definition, GSC was not. A lengthy discussion around this issue followed during which three suggestions were offered by GSC. First that only Scottish visitors should be counted because of the Government’s emphasis on delivering a ‘Smarter Scotland’. Second that both the GSC Tower and IMAX offered positive science engagement experiences and should therefore have visitor numbers included in any funding allocation model. Third that GSC’s outreach programme offered, in some cases, greater value in terms of science engagement than some inreach visits. Accordingly it would be wrong to exclude these from the visitor definition to be used for apportioning funding. None of these suggestions were approved by others in the group and it was jointly agreed that the individual SSCN members would contact the Scottish Government and advise them it had failed to reach a common definition over what constituted a ‘paying visitor’ and in this event OCSA, as ‘the customer’, should establish various definitions for the SSCN to work with.

7.2.2 An emerging model

The early model highlighted in chapter six, with broad KPI categories of social/community, intellectual/educational and financial was generally well received by the group. An initial comparison with the areas of interest expressed by the Scottish Government had highlighted a number of areas of comparability. Potential areas for

KPIs, generated during my interviews, were tabled as a useful starting point for the meeting (see table 7.4).

Table 7.4 Potential headline key performance indicators

Social/Community	Visitor numbers/attendance;
	Widening access (with segmentation);
	Customer satisfaction (typically includes things like VFM and dwell-time);
	Quality;
	Market share.
Intellectual Educational	Delivery against mission;
	Impact related; audience development;
	Careers promotion;
	Range of partnerships;
	Responsiveness to handling contemporary scientific issues.
Financial	Efficiency measures (most interviewees cited a range of ratios e.g. cost/visitor, earned income/visitor, attendance price/length of visit);
	Success in generating 'other' (non Scottish Government) funding;
	Wider economic impact of science centre on their local/regional community;
	Delivery of agreed budget

Given the now advanced point in the meeting little further discussion took place over the appropriateness of the specific KPIs identified above.

7.2.3 Advancing a common methodology

With the meeting having ceased making progress at this point and without decisions over the definition of a 'paying visitor' or share of school transport subsidy having been reached it was agreed that the group should meet again in advance of the 31st March 2008 deadline set by the Scottish Government. I agreed to carry out further work on the potential KPIs in order that these could be discussed and more fully presented at a follow-up meeting, to be held in advance of the 31st March 2008. The group agreed to meet again on the 20th March 2008.

If able to overcome the issues associated with the proposed new mechanism of funding the group concluded its first meeting by agreeing that it should be possible for a reporting framework and KPIs to be established which were acceptable to all SSCN members.

7.3 REFLECTING THE CHANGING ENVIRONMENT

Following my initial joint meeting with SSCN members and their outline approval of key themes for a new SSCN performance framework, I worked between meetings to develop an early SSCN framework that accommodated different influences in efforts to produce a robust and meaningful model. These included the views of the SSCN participants expressed during our meeting on the 26th February 2008, the expressed requirements of the Scottish Government in its letter of 1st February 2008 and the performance monitoring experience of other government-funded and science-based museums and galleries based in England.

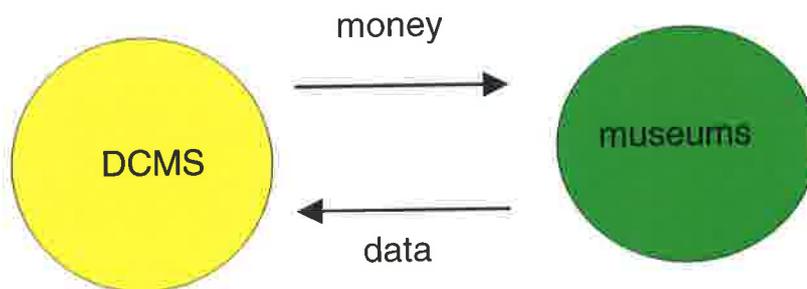
As a starting point I extracted the four strategic objectives identified by OCSA in its letter to SSCN chief executives (see appendix 12) plus the fifth based on VFM. Setting a strategic context to KPIs was identified as critical to the development of a framework during my initial meeting with the SSCN group. The proposition being offered to the SSCN by the Scottish Government seemed to be a transactional one in providing funding to the SSCN in return for delivering against its strategic objectives and in this regard reminiscent of the much earlier description in the SSCN strategy (2005) by former Deputy First Minister, Nicol Stephen.

Initially tabling the five objectives I then considered the grouping of KPIs around each of the Government's strategic objective. By this point the influences on KPIs had come

from a range of credible sources, including my interviews with 26 senior science centre professionals over two rounds of telephone interviews, my initial meeting of the SSCN group and the specific direction offered by the Scottish Government.

In addition I considered the experience of DCMS and its relationship with its sponsored museums, notably NMSI, The Natural History Museum (NHM) and MOSI. Having commissioned a study of its PI framework in 2006 (Morris, Hargreaves and McIntyre, 2007), it is interesting to my investigation that DCMS describe their relationship with their sponsored museums as moving from a transactional one, in which the DCMS provided funds with conditions that the museums satisfied by returning PI data, to one more based on partnership, founded on shared vision and values.

Figure 7.1 Early transactional model of DCMS



Adapted from Morris Hargreaves McIntyre 2007

Despite having benefited from a funding relationship with the Scottish Government for over four years the SSCN is not yet sufficiently developed in its relationship with the Government, or indeed with each other, to move to what appears to be a more favourable position. The first round of Scottish Government funding secured the immediate future of the SSCN centres but still demanded a considerable effort from each in moving to a more sustainable mode of operation - early Government aspirations

for greater collaboration between SSCN centres did not substantially happen for this reason. A shift towards a more relationship based approach could be something which the SSCN works toward over the course of the new round of Scottish Government funding.

A major value of the DCMS review is its critique of individual PIs in considering their definition, collection method, usefulness and whether they should be retained, refined or removed. While useful in developing the SSCN model, in terms of better defining several of the KPIs, I chose not to specifically adopt any descriptive aspects of the DCMS structure as felt it was important for the SSCN group to discuss and develop these amongst themselves through a democratic and collaborative process. The DCMS PIs that were particularly useful in helping me establish some better clarity were those around central government's interest in opening its institutions to the wider community in efforts to promote lifelong learning and social cohesion. The bringing together of these different influences is presented in table 7.5 and represents the first structured framework to have emerged from my investigation. This framework, with nineteen KPIs, clustered around five strategic objectives, was used as the discussion framework for my second meeting with the SSCN group on the 20th March 2008.

Table 7.5 Scottish Government linked discussion framework

Strategic Objective(s)	KPI(s)
To deliver agreed levels of visitor numbers at each centre and across the SCCN.	<ol style="list-style-type: none"> 1. Total number of ticketed visitors to each centre and the network; 2. Total number of child visits to each centre and the Network; 3. Total number of children in pre-booked education visits to each Centre and the Network;
To provide an inspiring, accessible and high quality focus for informal science education and engagement for Scots of all ages in our four largest cities.	<ol style="list-style-type: none"> 4. Number of C2, D, E, disabled people and black and ethnic minority visitors to each centre and the network; 5. Number of visitors aged over 60; 6. Percentage ticketed visitor satisfied with science centre service;
To complement the formal education science curriculum and promote science careers to young people, helping to ensure a future supply of scientists.	<ol style="list-style-type: none"> 7. Learning outcomes based KPI for education visitors (tbc); 8. HMIE rating; 9. VisitScotland Quality Assurance scheme rating; 10. Programme / activity links with <i>Curriculum for Excellence</i>;
To provide opportunities for Scottish Higher Education Institutes, Research Institutes, industry and business to showcase new scientific research, products and processes, highlighting the excellence of Scottish science and innovation, and the relevance and importance of science to the Scottish economy.	<ol style="list-style-type: none"> 11. Share of education audience (in-reach) by local authority; 12. Number of knowledge-transfer partnerships with HEI's;
	<ol style="list-style-type: none"> 13. Number of knowledge-transfer based exhibits (including showcasing of temporary exhibitions);

To demonstrate value for money for all public investment.	<p>14. Number of conference papers delivered;</p> <p>15. Government funding per visitor;</p> <p>16. Net income from trading (including corporate income);</p> <p>17. Net income from non-visitor generated income;</p> <p>18. Cost per visitor (to include all overheads);</p> <p>19. Efficiency savings (£)</p>
---	--

7.4 ADVANCING THE KEY PERFORMANCE INDICATORS

In opening my second meeting of the SSCN group I tabled the emergent SSCN framework shown in table 7.5 and briefly explained the development process I had undertaken since our previous meeting. The minutes of this meeting are detailed in appendix 15.

In identifying the main purpose of the meeting as reaching agreement of the KPIs it was recognised that the full detail of a new framework to include methodology and recommended reporting timescales might not be achieved during the meeting but require a subsequent telephone and e-mail-based correspondence in finalising any new framework's development. An early concern of several of the group was the large number of KPIs, having previously agreed that a relatively small number of KPIs was desirable. A subsequent discussion around each KPI was had in efforts to determine whether it should remain in the framework, be merged with others or be removed.

The resurfacing of the issue over share of network visitors to each SSCN centre, in determining future distribution of funds across the SSCN, threatened to derail the meeting and generated some questions over the value of a shared performance framework when a single indicator was to be employed as the basis of funding. Despite the sometimes heated discussion that followed, the group eventually agreed to put the Government's new mechanism for release of funding to one side, for the purposes of the meeting. It was agreed that it was in the interests of the SSCN to move forward, if possible, and achieve some productivity in considering a new and shared performance framework. This agreement to work towards agreeing a shared model, at a late but

critical point in my research process allowed me to complete my fieldwork as originally planned.

The minutes of the meeting (see appendix 15) provide a record of the subsequent discussion around the proposed nineteen KPIs, their fit with each of the Government's five strategic objectives, whether they should be retained, refined, removed, developed or combined in order to reduce the overall number of indicators. In total six of the KPIs shown in table 7.5 were agreed during the meeting (1,4,7,10,12,13), five were refined (2,3,5,6,11) and eight removed (5,6,14-19). The agreed KPIs were effectively adopted by the end of the meeting. Those requiring refinement were further developed in accommodating the comments of the group and, subject to these changes, also agreed and the eight removed were subject to e-mail discussion between the chief executives within the group between the 24th and 27th of March. This e-mail correspondence resulted in the development and agreement of a new 'careers promotion' based KPI (see table 7.6) and three new VFM-linked KPIs, in place of the five removed in the early discussion model. The new VFM-linked KPIs have the potential to mirror several of those reported annually by the membership of ASTC and so could allow the SSCN to begin benchmarking with other international comparators at some future point.

In addition to SSCN involvement, I also engaged with the OCSA team in providing regular briefings over the development of the framework. I did this in order to ensure that the framework came as no surprise to them. During one such briefing I highlighted that during its second meeting the SSCN group had felt that VisitScotland and HMIE ratings of centres were viewed by the group as hygiene factors and so should not be included. OCSA's response was that both KPIs reflected the qualified views of other

Government agencies or NGOs and so were of value to OCSA. As a result of this conversation I subsequently re-applied them to the framework and appraised the group of this discussion.

7.5 SECURING CONSENSUS OVER A NEW SSCN PERFORMANCE FRAMEWORK

Following over four months (December 2007 to March 2008) of extensive fieldwork, culminating in several e-mails between the SSCN chief executives, a new SSCN performance framework finally emerged. This is shown in table 7.6 and includes footnotes about the SSCN's wider interest in developing future KPIs which reflect the network's interest in wider categories of visitor than those expressed as of interest to OCSA, including educational outreach and teacher continuing professional development (CPD).

Driven by the timescale of producing an agreed framework of KPIs there is clearly still work to be done in developing and agreeing a shared methodology across each KPI and the overall framework. The Scottish Government proposed a deadline (see table 7.3) of 30th September 2008 for this wider development work.

Having submitted its framework in time for the 31st March 2008 deadline, it took almost three months for the Scottish Government to convene its next meeting of the SSCN (23rd June 2008). This meeting was called in order to discuss the Government's own developing thinking around the evaluation of SSCN performance. The iterative process now needed in further developing the SSCN performance framework sits outwith the scope of my investigation but it is hoped that the Government now works closely with SSCN centres in driving the model forward to adoption by the SSCN.

Table 7.6 Transactional performance framework between the Scottish Government and Scottish Science Centres Network

Strategic Objective(s)	KPI(s)	Methodology	Frequency of Measurement / Reporting	
To deliver agreed levels of visitor numbers at each centre and across the SSCN.	1. Total number of ticketed visitors to each Centre and across the SSCN.	Common definition. Data collected through EPOS systems.	Measured daily – reported quarterly.	
	2. Total number of child visits (0 to 16 years) to each centre and across the SSCN.	Common definition. Data collected through EPOS system.	Measured daily – reported quarterly.	
	3. Total number of children in pre-booked education visits to each Centre and across the SSCN.	Reported by category (pre-school, P1-P3, P4-P7, S1-S2, S3-S4). Data collection through booking systems.	Measured daily – reported quarterly.	
	To provide an inspiring, accessible and high quality focus for informal science education and engagement for Scots of all ages in our four largest cities.	4. Number of C2, D, E, disabled people and black and ethnic minority visitors to each centre and across the SSCN.	Data collection through common survey, to include common collection methods, sampling methodology and evaluation.	Measured quarterly – reported annually.
		5. Share of (in-reach) education audience (number of schools and number of pupils) by local authority for each centre and across the SSCN.	Measured by employing shared education database currently being developed by SSCN.	Measured annually – reported annually.
		6. Number of retired person to each centre and across the SSCN.	Data collected through EPOS system.	Measured daily – reported quarterly.

	<p>7. Customer satisfaction levels at each centre.</p> <p>8. VisitScotland quality assurance rating.</p> <p>9. HMIE rating.</p> <p>10. Learning outcomes based KPI for education visitors (tbc) – centre specific.</p> <p>11. Programme / activity links with <i>Curriculum for Excellence</i> – centre specific.</p> <p>12. Careers promotion activities.</p> <p>13. Number of knowledge-transfer partnerships with HEIs at each centre and across the SSCN.</p>	<p>Measured through a commonly agreed visitor survey (tbc) – to include separate education based satisfaction survey.</p> <p>Measured by VisitScotland.</p> <p>Determined by HMIE inspection.</p> <p>Measured by SSCN education based quality assurance framework (currently being developed).</p> <p>Measured by activity / programme and education based quality assurance framework (currently being developed by SSCN).</p> <p>Tbc.</p> <p>More sophisticated measure to be developed beyond year 1 in order to demonstrate levels and quality of engagement.</p>	<p>Measured monthly – reported annually.</p> <p>Rating generated bi-annually.</p> <p>Rating generated bi-annually.</p> <p>Measured by programme – reported annually.</p> <p>Monitored regularly – reported annually.</p> <p>Tbc.</p> <p>Continuous measurement – reported annually.</p>
<p>To complement the formal education science curriculum and promote science careers to young people, helping to ensure a future supply of scientists.</p> <p>To provide opportunities for Scottish Higher Education Institutes, Research Institutes, industry and business to showcase new scientific research, products and processes, highlighting the excellence of Scottish science and innovation, and the relevance and importance of</p>			

science to the Scottish economy.				
	14. Number of knowledge-transfer based exhibits (including showcasing of temporary exhibitions) installed or exhibited by each centre and across the SSCN.	Suitable qualitative measures to be identified which better demonstrate levels of engagement.		Reported annually.
	15. Percentage of total income from earned income.	Common collection methods that also provide mechanism for comparison / benchmarking with others outwith the SSCN.		Reported annually.
	16. Percentage of total income from public funds.			Reported annually.
To demonstrate value for money for all public investment.	17. Percentage of total income from (non-public) grants and donations.			Reported annually.

* Network partners felt that other categories of visitor were also important for each centre to count, not for current OCSA purposes, but their own. These included the total number of corporate visitors, outreach visitors and virtual (web based unique visitors) visitors. SSCN members encouraged to reach common definitions for each category and to record separately.

** The OCSA has highlighted its interest in providing financial support of the SSCN in return for a focus on public engagement activities associated with visits (leisure and education) to the science centres. The work of science centres in other areas e.g. outreach and teacher CPD is also important and could make a major contribution to the delivery of future OCSA and other government department's strategic objectives. For this reason SSCN members should be encouraged to work together to create common methodologies that would support any future reporting requirement around these areas of interest for the SSCN.

7.6 SUMMARY

Chapter seven brings together the major development work I have undertaken, with an extended knowledge-community, in advancing and agreeing a shared performance framework, with accompanying KPIs, for the SSCN. This activity was completed and forwarded to the Scottish Government by their 31st March 2008 deadline.

The framework that has emerged out of my investigation represents a starting point, one that is largely quantitative and output-based but which reflects the aspiration of both the SSCN centres and the Scottish Government in becoming more qualitative, evaluative and outcome-oriented in its shared desire to better demonstrate the value and impact of the network and its constituent parts. Moving to this position will take time but the SSCN has at least developed an agreed starting point.

That the SSCN was able to overcome the early funding-related issue that looked like it might threaten the development of a consensus-based model is also positive and bodes well for the future development of the SSCN and its membership. Despite this, however, there remain several threats to the completion and ultimately the adoption of the framework. Uppermost of these is GSC's refusal to accept the Scottish Government's reported intention of linking future SSCN funding to just one of its identified KPIs: share of Network visitors to each centre. Scottish ministers are currently (September 2008) considering their next steps as to whether they move forward with the funding plans, already shared with centres and the Scottish media, or whether they will now consider other mechanisms for determining individual centre funding levels. The final decisions of Scottish ministers will determine what happens next with the framework and potentially the future development of the wider SSCN.

CHAPTER EIGHT

CONCLUSIONS

8.0	INTRODUCTION	8-2
8.1	REVIEW OF RESEARCH OBJECTIVES	8-3
8.2	ACHIEVING MY RESEARCH AIM	8-6
	8.2.1 The benefits of funding a business efficiency model	8-7
	8.2.2 The fit of an agreed performance framework to a diverse SSCN membership	8-8
	8.2.3 The transferability of a Scottish model to other science centres	8-9
8.3	MY PRINCIPAL RESEARCH QUESTION	8-11
8.4	THE CONTRIBUTION OF MY RESEARCH	8-13
	8.4.1 Contribution of research to theory	8-13
	8.4.2 Contribution of research to practice	8-13
8.5	LIMITATIONS	8-14
	8.5.1 Limitations of research	8-14
	8.5.1.1 <i>Resource</i>	8-14
	8.5.1.2 <i>Approach</i>	8-14
	8.5.1.3 <i>External factors</i>	8-16
	8.5.2 Limitations of performance framework model	8-16
	8.5.2.1 <i>Scottish context</i>	8-16
	8.5.2.2 <i>An outputs based framework</i>	8-17
	8.5.2.3 <i>Adoption of the new framework</i>	8-17
8.6	FUTURE RESEARCH OPPORTUNITIES	8-17
8.7	PERSONAL REFLECTIONS	8-19
	8.7.1 Personal understanding	8-19
	8.7.2 Strategic perspective	8-19
	8.7.3 Future research interests	8-20

CHAPTER EIGHT

CONCLUSIONS

8.0 INTRODUCTION

In chapter seven I chart the development of the performance model and KPIs which emerged out of the two phases of my fieldwork. I also gave consideration to the growing expectations of the Scottish Government, expressed in its letter to SSCN chief executives in February 2008. This included a shift in the mechanism for distributing funds across the SSCN centres and a stated desire to see the SSCN develop a shared performance measurement framework in efforts to better demonstrate the SSCN's delivery against Scottish minister's ambitions for a 'Smarter Scotland'.

The early KPIs, my wider research findings and the new direction of the Scottish Government were fed into two rounds of joint meetings of the SSCN representatives of my knowledge-community. Despite threats that the newly-proposed funding mechanism would derail the process my SSCN group was able to advance its discussions and reach agreement over a new performance framework. This framework was passed to the Scottish Government in advance of the deadline which it had set the SSCN for responding.

In concluding my thesis I present chapter eight, my conclusions, in six parts. In part one, I review my research objectives and early research questions and my progress in advancing them to the point of achieving my research aim. In part two, I consider how my investigation has addressed my principal research question '*How can government funding of science centres better facilitate government policy on PES?*'. In part three,

I highlight the significance of my findings both to theory and practice, its contribution to the SSCN, its Government sponsors and potential for use by the wider science centre field. In part four, I reflect on the limitations of my research before pointing to a number of areas for further research in part five. In concluding my thesis, in part six, I offer some personal reflections about my professional doctorate journey, its effect on me as a science centre chief executive and likely influence on my future personal and professional development.

8.1 REVIEW OF RESEARCH OBJECTIVES

In conducting this investigation my research aim was to establish a new performance and accountability framework for adoption by the SSCN. In addition to meeting the growing performance and accountability expectations of the Scottish Government my research aim also sought to recognise the growing need from those who sponsor/fund science centres to see a demonstrable return on their investment. I identified the following research objectives in efforts to advance my research aim:

- 1) Consider the changing nature of science, the drivers of this and the role of science centres in helping fulfill government's interest in PES;
- 2) Consider relevant management practices to include management of public funds;
- 3) Conduct a situational analysis of factors influencing recent change, employing appropriate environmental scanning tools;
- 4) Identify good practice in relation to performance frameworks, associated performance indicators and their implementation across formal and/or informal networks;
- 5) Consider an emergent model that is appropriate for the Scottish context, making comparisons and drawing out lessons to be learnt from others;

- 6) Share findings of research with major Scottish stakeholders in efforts to achieve a consensus position.

My first two objectives were substantially met by my literature review which highlighted the shift in the nature and ownership of scientific research during the last forty years. This has contributed to a decline in public confidence in science and those seen as controlling it. Awareness of this shift in public confidence has contributed to a growing interest by UK central government in the methods and mechanisms through which public confidence might be rebuilt. Science centres have been highlighted as one of several mechanisms that might be usefully employed albeit central government's continued questioning of the value of science centres in promoting and democratising science means they have yet to be properly engaged. That science centres themselves have yet to understand their full potential was clear from the literature and supported the need for a new framework against which to measure performance. The literature also suggested that by accepting government funding centres could expect to see a control and accountability agenda being applied that could influence their future outputs, objectivity and relationship with their own visiting public.

I addressed my third objective in chapter four by carrying out an audit of the change experienced by Scotland's science centres since their earliest dialogue with the Scottish Executive in 2003. Drawing on a significant volume of archival material, including the periodic reviews of the SSCN, I charted the development of the four centres relationship with the Government up to the announcement that the centres had secured a second three year term of funding in early 2008. The Scottish Government's expectations of the SSCN centres has grown during this period and led to a shift in funding away from one based on need to one more focussed on the performance of centres. While

demonstrating the Scottish Government's developing thinking around their support for the SSCN the recent change in emphasis by Government has highlighted the developing accountability agenda towards the centres.

In advancing my remaining research objectives I undertook two phases of field research in initially drawing on the experience of an international group of senior science centre professionals, my knowledge-community, and secondly with just the SSCN component of this group. My search for examples of the performance frameworks being employed by others generated surprisingly little response. While other models were highlighted these were typically described as being resource intensive and a burden on the science centres involved. The nature of centre's relationship with their government also heavily influenced reporting requirements with government typically setting the reporting conditions. Other than being members of science centre affiliate organisations few of my sample were members of formal or informal networks that had a specific reporting requirement in anything as structured as a framework and so other than the Council of Australian Museum Directors no other models were offered.

In the relative absence of any other network-based performance framework the opportunity to draw on the extensive experience of my knowledge-community was a key feature in my being able to enter my final phase of research with informed and considered discussion material. Over the course of two rounds of telephone interviews I was able to identify an early performance model that identified social, intellectual and financial categories of performance and advice over how any new framework might be most effectively implemented across a small but diverse network of science centres.

In my final phase of research I held two face to face meetings with the chief executives and scientific directors of the SSCN centres. Over two rounds of meetings this group took the early emergent model from my first phase of field research and shaped it into an agreed framework which fitted the Scottish context. While shaped without direct involvement from the Scottish Government these discussions and the resulting final framework were heavily influenced by the direction given to centres by the Government in its announcement of a second term of funding for the SSCN. The Government's announcement of a new method of funding would see one of the centres receive significantly less funding than in previous years and created a shift in emphasis that threatened to de-rail my own discussions with centres. Despite this the group was able to move forward and reach agreement over the new framework.

8.2 ACHIEVING MY RESEARCH AIM

While the success of any new performance model can only be fully determined once implemented my investigation has led to the establishment of an agreed performance framework for the SSCN where previous attempts have failed. A major feature in my being able to move beyond earlier attempts was my early inclusion of the key stakeholders in the process - the SSCN centres themselves. That the new framework developed through several rounds of interviews, in its first phases supported by a large knowledge-community, and latterly through iterative discussions between SSCN representatives points to a framework which not only meets the needs of the centres but which will also importantly give the Scottish Government a useful mechanism with which to measure the effectiveness of the SSCN, individually and collectively, against delivering its expressed strategic objectives for centres.

In advancing my research aim I identified several questions, including: what was the Scottish Government's basis for funding a business efficiency model when the majority of outputs and outcomes associated with science centre activity are education or PES related?; would a new framework fit all of the SSCN centres?; and how transferable would a Scottish model be to science centres elsewhere?

8.2.1 The benefits of funding a business efficiency model

The Scottish Executive's original financial support for the SSCN provided the four Scottish centres with a much-needed financial lifeline and in doing so protected a major asset base, much of which had been created since the turn of the new millennium. Throughout this period Scottish ministers were consistent in their message to centres of wanting to see them demonstrate VFM in return for public funds. To this end centres were expected to demonstrate sound commercial practices and efficiency savings, where possible. This remains in evidence with the quarterly submission of trading information against agreed financial budgets still being a condition of grant draw-down for the four centres. While unsustainable, this approach did provide the four centres with some certainty of a future and an important opportunity to begin expanding their education and PES activities.

The Scottish Government's recently revised mechanism of support for the SSCN recognises that the underlying business models of the SSCN centres is flawed; the centres cannot sustain themselves on commercial activity alone. The new approach also, importantly, recognises that the SSCN has a strategic role to play in advancing Government ambitions for science education and promoting PES. The early model of funding adopted by the Scottish Government has sustained the four science centres and

allowed each to begin to mature in terms of their own science based aspirations. The opportunity in shifting funding model at this stage in the SSCN's development is that as a network it is now better placed to deliver against the Government's strategic objectives.

8.2.2 The fit of an agreed performance framework to a diverse SSCN membership

The agreement of a new performance framework by the SSCN is testament to the fact that 'fit', even within a diverse network, is possible. The approach adopted by the SSCN, in working towards a consensus model, was not to deliver a one-size-fits-all framework but instead to select KPIs which were meaningful to each centre and the wider SSCN in working towards delivering the Scottish Government's expressed strategic objectives for the network.

Any attempt by Government to compare performance between the four SSCN centres using its agreed KPIs would, in most instances, prove meaningless because of the many difference between the centres, including scale, demography of audience and theme of centre. The new framework does lend itself to benchmarking with other centres but the comparators for individual SSCN centres, e.g. scale and audience, will need to be found outside the SSCN.

Reporting each SSCN centre's own performance using the agreed KPIs will importantly demonstrate individual progress is being made against delivering the Government's objectives, while several of the KPIs lend themselves to considering an aggregate approach to performance measurement that will highlight the SSCN's overall contribution. This is an important feature of the new framework as it provides an

important opportunity for each of the four centres to promote their uniqueness but also to come together as a network when sensible to do so. An emphasis on individual and aggregate performance is also likely to keep competition for funding between SSCN centres to a minimum.

8.2.3 The transferability of a Scottish model to other science centres

The changing nature of science in the UK during the last forty years, its drivers and consequences on public trust and PES are common across the UK. In this regard the opportunities for science centres to play a contributory role in tackling associated issues are as valid in England, Wales and Northern Ireland as they are in Scotland. The experience of my other, non-UK, interviewees was similar in this regard and seemed unchecked by political or geographic boundaries.

The early impetus for change in Scotland was driven by the shared unsustainable business model on which its science centres were based. This was clearly demonstrated by the closure of one centre and could have quickly led to the closure of others had the Scottish Executive decided not to fund them.

The size and spread of the SSCN has also been a contributory factor in its attractiveness to the Scottish Government as for a small annual investment the four centres have the potential to play an important role in advancing Scottish ministers ambitions for a ‘Smarter Scotland’. The new SSCN performance framework will help the network and Scottish Government chart its progress against delivering these ambitions. The small number of centres also seems equally attractive to the devolved governments in Northern Ireland and Wales. The level of public funds required to support a large and,

by comparison, complex English network of science centres may be a contributory factor for why they have not already received funding.

The major reason for briefly highlighting the funding landscape for science centres around the UK is that the major issue to transferability of the new SSCN performance framework to others in the UK and potentially elsewhere is that Scottish centres already have an established and now maturing funding relationship with their Government. Having initially funded the SSCN because of ‘need’ the Scottish Government has quickly moved to a position of recognising the educational and PES promotion potential of the network. A major driver in my being able to advance a performance framework to consensus is the Scottish Government’s own request that the SSCN become more strategic in supporting Scottish ministers’ ambitions for Scotland.

The continued absence of a funding relationship between science centres in England and UK central government, central government’s continued questioning of the value of its science centres and the associated absence of any collective strategic direction for English centres suggests several barriers to the adoption of any new model, let alone the new SSCN framework. The emphasis of the Scottish Government on the SSCN developing a framework which clearly demonstrates economy, efficiency and effectiveness in return for continued public funding could be a useful starting point for proactive adoption by English science centres in jointly demonstrating an early commitment to the expectation that would accompany any future decision to fund English centres by central government.

Central, state and federal political and funding boundaries are likely to prevent the adoption of the SSCN framework by other science centres. There is, however, scope for

the international membership organisations which represent science centres to promote the adoption of specific KPIs, a core, in the interest of being able to better promote international benchmarking between science centres.

8.3 MY PRINCIPAL RESEARCH QUESTION

My principal research question was *'How can government funding of science centres better facilitate government policy on PES?'*. My research has shown that science centres, internationally, have much to offer their respective governments in return for a funding relationship. Their physical qualities, coupled with their collectively high attendance levels and increasingly rich activity and partnership base make science centres a highly relevant and attractive partner in supporting government's growing interest in PES. The current emphasis by UK central government and others on the *value* of science centres is, however, not helpful. This value is typically attributed to their effectiveness in engaging a visiting public with a science agenda and in measuring their ability to demonstrate that learning has taken place, either during or after the science centre visit. The difficulty in measuring either with any degree of accuracy, in venues which are based on informal learning, is well documented in the literature. This should not mean that because the 'impact' of the science centre experience is difficult to measure that it is of no value. On the contrary, there is considerable anecdotal evidence, and from sufficiently different sources, to suggest that science centres are making a very positive contribution to promoting both PES and science learning. A major challenge for science centres moving forward will be how they better evidence this contribution to their government sponsors.

The evidence of science centres delivering against the policy interests of their government is not well documented. My own investigation has shown that many science centres have an existing relationship with their governments and are working to deliver public programmes that are of specific interest to government. Here is perhaps a better way for governments to determine the value of their science centres and against areas of policy interest and not necessarily policy restricted to PES. In specific relation to delivering against PES-related policy, it is important that both science centre and respective government have a clear understanding of what each wants from its PES activity in fitting with policy objectives.

More widely than policy delivery my investigation has also shown that science centres can directly influence government policy on PES. In order to do this the science centre must develop a close relationship with civil servants and ministers, and effectively secure a 'seat at the table'. In one notable example drawn from my knowledge-community a centre had actually written the science strategy for the country in which it is based.

The Scottish Government's developing strategy towards the SSCN centres has been informed by a number of consultant led reviews of the network. These have helped inform the Government's interest in the SSCN and fuelled development of a small number of strategic objectives by Government with an associated expectation of short-term outputs and longer-term outcomes being developed and adopted by the SSCN. These developments were incorporated into the consensus building phase of my investigation. The maturing approach of the Scottish Government, particularly if implemented through closer and engaging collaboration with the SSCN, holds the

potential of seeing the SSCN making a demonstrable future contribution to delivering against the Government's policy interests.

8.4 THE CONTRIBUTION OF MY RESEARCH

8.4.1 Contribution of research to theory

The published research on science centres is currently limited and restricted to the work of a handful of senior science centre professionals and academics. What research is available is becoming dated in a sector that, at least in UK terms, has become much more dynamic since the arrival of the MC-funded science centres in 2000 and 2001. Much of the research base that does exist focuses on the value of science centres from either an education or economic perspective. My own research has been grounded in practice as much as in theory and from both perspectives has attempted to take a pragmatic approach to dealing with a real issue. That my research has developed with the input of a large and experienced knowledge-community has been a key feature of my investigation and is an approach which has been adopted by few others. I employed this approach in efforts to generate as significant a new knowledge base as possible before channelling this through my core group of SSCN representatives.

8.4.2 Contribution of research to practice

The major contribution of my research has been in tackling a change-based issue facing the SSCN. The opportunity to dovetail my research with the specific requests of the Scottish Government fulfilled one of the Government's funding requirements of the SSCN. My research has also advanced an area of Government interest where earlier cyclical attempts by others had failed.

Once approved, finalised and adopted the new framework has the potential to make an important future contribution to the SSCN in its efforts to deliver the Scottish Government's agenda for science learning, education and PES. The delivery of the SSCN against these objectives will heavily influence Scottish ministers decisions over whether or not to continue to fund the SSCN once its current funding period ends (April 2011).

8.5 LIMITATIONS

8.5.1 Limitations of research

There are several limitations associated with the scope of my research and principally around the broad themes of resource, approach and external factors.

8.5.1.1 Resource

The major resource implication I faced in fully addressing my role as participant-observer was time. As chief executive of one of the study organisations (Dundee Science Centre) at the outset of my investigation and a second (Satrosphere) by its conclusion, the challenge of managing a research process along with two small but demanding organisations has been significant. That Satrosphere was on the brink of closure during my early involvement and is now approaching its first financial breakeven is illustrative of my additional workload.

8.5.1.2 Approach

Limited time availability coupled with a geographically-dispersed sample meant that my ability to undertake direct-observation was effectively curtailed. Had I undertaken direct observation, even within a small (perhaps UK) sample, this would have aided

description, development of a case study approach and potentially generated a more complete raw model to discuss with my SSCN study group.

Additionally, in representing two of the four SSCN centres, my role in both organisations had the potential of introducing significant bias in the final group stages of my investigation. Having identified this potential at an early stage I had invited the scientific directors of both ODE and GSC to join my study as participants. These two representatives were the only non-chief executives in my knowledge-community but in spite of this their contribution to both interview and final meeting stages of my investigation were invaluable.

The intentional spread of members of my knowledge-community created a practical limit to my overall sample size and so while having adopted a sampling technique designed to select some of the most experienced science centre professionals in the field it naturally selected many, but not all. This was evidenced by my snowballing technique which highlighted several interviewees who are not on the management committees of science centre membership bodies.

One notable stakeholder, whose decision not to participate in my study had the potential to affect both the scope of my research and the new framework's adoption, was the Scottish Government. Keen not to be seen to influence my research, the Scottish Government's decision not to participate in my study carries a number of consequences, not least of which is the new framework's acceptability to Government. Despite this decision I did keep the relevant civil servants informed of my progress in efforts to keep the development of the framework moving forward smoothly. Having submitted the newly-agreed framework to the Government in advance of its 31st March 2008 deadline,

only recently (June 2008) have discussions around SSCN performance measurement and evaluation recommenced and still (September 2008) remain a work in progress.

8.5.1.3 External factors

The Scottish Government's announcement of continuation funding to the SSCN in February 2008 coupled with its short deadline for responding to joint-SSCN decisions and actions placed significant demands on the two meetings of my SSCN group. Effectively having to meet twice in the space of less than a month put a great deal of pressure on the final stages of my investigation, pressure which at one point looked like it would collapse my efforts of trying to secure a consensus position.

My research was also hampered by Scottish Government decisions to shift the emphasis of funding SSCN members to a single KPI i.e. network share of visitor numbers. The consequences of this new approach on funding for one of the centres, GSC, threatened to derail my investigation and at a critical and advanced stage.

8.5.2 Limitations of performance framework model

While several factors introduced limitations to the scope of my research others have potential to limit the usefulness of the resultant new performance framework – these include context, the basis of the agreed framework and the likelihood of its adoption.

8.5.2.1 Scottish context

The basis of my investigation was one of need to develop a new performance framework for the SSCN, which fit with a shifting Scottish context and the growing expectations of its major funder, the Scottish Government. While early interview stages of my research drew from an international knowledge-community, final stages were

focussed on the Scottish context and the strategic objectives identified for the SSCN by the Scottish Government. While the majority of agreed KPIs are of relevance to many science centres, their overall strategic context is specific to Scotland and so in all likelihood of limited usefulness to science centres out-with Scotland.

8.5.2.2 An outputs based framework

The outputs based framework generated through my investigation has limits in its ability to demonstrate the SSCN's impact on science learning and PES. While providing a framework that will allow each of the SSCN centres' progress to be measured against delivering the Government's strategic objectives, it is recognised that the new framework is merely an important starting point.

8.5.2.3 Adoption of the new framework

The success of any performance framework can only be evaluated if it is adopted. Having set a short deadline for response, the lengthy delay by the Scottish Government in further advancing discussions with the SSCN over its agreed framework, is a concern. This delay may, in part, be attributable to the rejection of the Government's proposed new funding mechanism by GSC. Ministers' decisions over how they address this situation will likely determine whether or not the new framework is taken forward and in turn potentially shape the SSCN the contribution made by the SSCN moving forward.

8.6 FUTURE RESEARCH OPPORTUNITIES

My research has repeatedly demonstrated that there is much more to know about how effective science centres are in delivering an agenda around promoting PES, which most share. An awareness of the need to develop a stronger research agenda around science

centres is nothing new having been previously highlighted (see section 2.2.3 of chapter two) by Heureka's Per-Edvin Persson (2000). That the research base around science centres has not substantially moved on in the last eight years belies a significant current interest in the contribution of science centres to promoting science in society.

If governments are to provide their science centres with financial support then there does need to be a stronger evidence base around their potential effectiveness in delivering against government's growing interest in promoting PES. The need for this is clearly demonstrated in England's current situation and its absence seems to be an important factor in why a decision by UK central government to fund centres has not yet been reached.

A further challenge for English centres is that central government currently seems to be hung-up on the inability of science centres to demonstrate their impact around delivering science learning and promoting PES. The developing situation in Scotland highlights that the effectiveness of science centres might also be demonstrated by their delivery of strategic objectives in a transactionary relationship with government. Significant further scope exists for research into the effectiveness of science centres in delivering against such funder-objectives.

More widely for the science centre field, and identified repeatedly by my interview candidates, is a desire to establish outcome-based KPIs which help capture the *value* of the science centre experience. The answer to this question was described by several of my interviewees as the "*holy grail*" of science centres. Even ECSITE-UK (2008) has stated that agreeing a set of sophisticated KPIs for SDCs is the ultimate aim of our sector both in the UK and internationally. While the answer to the wider question

around the specific value of science centres is likely some way off an interim measure would be the further development of a range of outcome- based KPIs, which demonstrate a high degree of repeatability beyond a single science centre experience.

8.7 PERSONAL REFLECTIONS

The process of undertaking a professional doctorate has been a highly challenging but rewarding one. The timing of my study has coincided with one of the most demanding periods in my career and required a high degree of personal organisation and commitment to the process. My investment in this process has definitely been worth while and been of benefit to me on a number of fronts.

8.7.1 Personal understanding

When I started my doctorate in March 2006 I had very little awareness of PES, other than recognising something of its growing importance to science centres. This is despite having been chief executive of a science centre for over four years by that time. During the ensuing period of study I have developed a much more detailed understanding of PES and its importance to a range of stakeholders, not just science centres. This better understanding has directly influenced the activities of my own organisation in its own efforts to better engage a visiting public with a science agenda.

8.7.2 Strategic perspective

The development of a stronger PES orientation in my own organisation has led to the development of strategic links with other local, regional and national organisations that share a similar interest. To this end I am currently discussing the potential for creating a joint chair for PES with the University of Dundee. This development has the potential to significantly increase our understanding of PES and advance the future research agenda

highlighted in section 8.6. My understanding of performance frameworks and indicators, in the pursuit of economy, efficiency and effectiveness, has also grown considerably and, linking back to my opening paragraph of this thesis, has equipped me with a range of strategic tools that will help me better identify and tackle the future waves of change that will face my organisation.

The opportunity of working with an international group of senior science centre professionals in developing my thesis has given me an insight into best practice elsewhere and opened my eyes to a broader horizon in terms of the types of issues facing the science centre sector world-wide.

8.7.3 Future research interest

In addition to the practical benefits of undertaking this professional doctorate I have also developed a personal interest in contributing to advancing both my and others' future understanding of the science centre sector. This is not an interest I would have likely developed had it not been for the last two and a half years of study.

CHAPTER NINE

DOCTORAL UPDATE

9.0	INTRODUCTION	9-2
9.1	ADVANCING A FRAMEWORK FOR SCOTLAND'S SCIENCE CENTRES	9-3
9.2	MOVING FROM PERFORMANCE AND ACCOUNTABILITY TO EVALUATION	9-4
	9.2.1 Implementation timetable	9-11
9.3	A COMPARISON OF FRAMEWORKS	9-12
9.4	NEXT STEPS	9-13

CHAPTER NINE

DOCTORAL UPDATE

9.0 INTRODUCTION

In chapter eight I concluded my thesis with a review of progress against meeting my investigation's research aim and objectives. While fulfilling all of my original propositions my investigation fell short of implementation and evaluation as the adoption of the resultant performance and accountability framework by the Scottish Government sat outwith my control or influence. A delay in feedback on the new framework, caused in no small part by a dispute over the Government's new mechanism for distributing its funding, threatened to fracture the network and undermine the adoption of the framework. I recognised the potential that my framework might not be adopted and implemented and identified this as a limitation in my research. Since concluding my main investigation the Scottish Government have made advances in both developing and implementing a network wide framework and in chapter nine I discuss these developments and draw comparisons with the outputs of my own investigation.

In providing a post-investigation update I will address chapter nine in four parts. In part one I discuss the transition between submitting my investigations performance and accountability framework and early re-engagement by the Scottish Government. In part two I describe the new approach being driven by the Government towards evaluation of SSCN performance outcomes. In part three I draw comparisons between the Government's new approach and the framework which I submitted to them in March 2008. In concluding this brief update I consider some of the likely next steps of the

Scottish Government in advancing the development of their own evaluation framework for the SSCN.

9.1 ADVANCING A FRAMEWORK FOR SCOTLAND'S SCIENCE CENTRES

Having submitted my investigation's performance and accountability framework in late March 2008 neither I or other members of the SSCN have received any formal feedback on its suitability and now over twelve months (April 2009) after its submission. Despite the lack of direct feedback SSCN representatives, including myself, were invited to meet with the Scottish Government in late June 2008 to discuss a *Scottish Science Centre Evaluation Framework*. Unlike previous meetings with the Scottish Government the meeting was led by representatives of the Office of the Chief Researcher (OCR) and not OCSA albeit OCSA representatives were in attendance.

The OCR's analysts opened the meeting by describing their role in Government as providing high quality analysis and evidence to advise ministers and policy colleagues in policy development, implementation and evaluation – including policy and programme evaluation. This qualification for the involvement of OCR demonstrated further maturing in the Government's approach to working with the SSCN and has fuelled a continuing, intelligent, dialogue between the Government and the SSCN.

The remainder of this initial meeting with OCR was to discuss their developed thinking around evaluation of the SSCN which they described as having been fuelled by the responses of the SSCN (presumably the submitted performance framework albeit no direct connection with this was made) and their internal discussions with OCSA. This included the tabling of a new evaluation framework for the SSCN (see table 9.2) .

9.2 MOVING FROM PERFORMANCE AND ACCOUNTABILITY TO EVALUATION

While shifting the use of language from performance and accountability to evaluation the new OCR framework continues to support performance management and accountability in describing the role of evaluation as systematically assessing what is being delivered and what difference Government is making by delivering policies and programmes using public money; current Government focus on outcomes means an important role in assessing effectiveness and contribution; and, evaluation should provide learning for everyone. This description is congruous with the framework developed through my own investigation as are the purpose and principles laid out by OCR over its own evaluation framework:

1. The Evaluation Framework sets out an impact evaluation, with each of the components working together to identify and measure science centre contribution to developing a science culture in Scotland;
2. The science centres need to work in collaboration with science community and the wider public to successfully implement the Evaluation Framework;
3. The Evaluation Framework is a process of learning and developing with an emphasis on development through sharing good practice and building an evidence base over the next 3 years;
4. The Evaluation Framework builds on existing information, contributing support from the Scottish Government, minimising the burden of reporting;
5. The Evaluation Framework is not prescriptive in the detail of what science centres should do, rather sets out a common approach and key indicators across all science centres, which the centres will then report on. This will enable science centres to tell their unique stories within a common narrative of public engagement.

That OCR commit to building an evidence base over the remaining term of current SSCN funding is encouraging as clearly the potential of such a body of evidence is that it will support a case for continued Scottish Government support of the SSCN into a third term of funding. The emphasis on learning and development of the new framework over this period of time also gives an early indication of the Government's ambition for

its new framework but also that considerable work is still to be undertaken if a balanced framework for evaluating centre's performance is to be achieved.

In expressing their interest towards evaluation OCR developed an evaluation results chain which is shown in table 9.1. This results based management approach towards evaluation seeks to provide clarity over the cause-and-effect relationship between Scottish Government funding of the SSCN and their impact in advancing PES and a democratising science agenda. In doing so the Government demonstrates the continued emphasis of its something-for-something agenda re-iterated periodically throughout its funding term of the centres.

The Government's evaluation chain highlights the emergence of KPIs from the Government itself. In furthering elaborating its focus toward evaluation OCR also circulated a detailed evaluation framework. Shown in table 9.2 the framework highlights strategic objectives, KPIs, measures, methods of measurement, frequency of measurement and lead for each.

In support of its new framework OCR have provided further elaboration in highlighting the importance of specific scientific themes (sustainable energy technologies, life sciences, nanotechnology, opto-electronics and lasers and environmental sciences), peer review and dialogue (including with the public) at a local, national and international level, partnership and an emphasis on learning which reaches far beyond simple knowledge acquisition. These broad themes provide a wider overall context for the Government's new framework which clearly demonstrates the Government's ambition.

Table 9.1 Scottish science centre evaluation results chain

		EVALUATION RESULTS CHAIN		
		2008-9	2009-10	2010-11
WHY?	<p>END RESULT Contribution to developing a Science culture in Scotland 1. Population wide awareness and attitudes 2. Interest / uptake of scientific careers</p>	X		X
WHAT?	<p>PRACTICE AND BEHAVIOUR 1. Sound science: Ensuring quality of science content. 2. Contemporary Science: Promotion of cutting edge science and innovation</p> <p>KNOWLEDGE, SKILLS AND ABILITIES 1. Link to educational quality national standards 2. Complement the formal science curriculum 3. Impact on learning outcomes</p>	X	X	X
By	<p>REACTIONS 1. Visitor satisfaction and experience 2. Tourist branding</p>	X	X	X
WHOM?	<p>ENGAGEMENT / REACH 1. Visitor attendance 2. Visitor demographics</p>	X	X	X
HOW?	<p>ACTIVITIES / OUTPUTS Science Centre Science Engagement Activities</p> <p>INPUTS SG Funding of Scottish Science Centres for Science Engagement</p>	X	X	X

That OCR have also questioned the appropriateness of existing learning-based evaluation tools such as ‘Pledge to Learners’ in judging the quality of evidence it gathers is equally significant in demonstrating an approach which seeks to be both meaningful and useful.

Table 9.2 Scottish Government's evaluation framework

Strategic Objective: Contribution to developing a science culture in Scotland				
KPI	Measure	Method	Frequency	Lead
Promote awareness and use of science	<ul style="list-style-type: none"> • Awareness of science centres? • Recent visits to science centres. • If not, why not? If yes, why? • What people think a science centre is, have they heard of any of them? • Other questions of interest to OCSA? • Possible questions to under 16 year olds? 	Omnibus survey	Annual	OCR
Up-take of science careers	<ul style="list-style-type: none"> • Ipsos MORI Scotland omnibus survey of secondary school pupils in Scotland. 	Omnibus survey	Annual	OCR

Strategic Objective: Inspiring				
KPI	Measure	Method	Frequency	Lead
Sound science Ensuring quality of science content Contemporary science Promotion of cutting edge science and innovation	<ul style="list-style-type: none"> • Peer review. • Dialogue and debate between science and the public. • Partnership with business/academia. • Scientific advisory boards. • Creative participation in UK and International Networks. • Arrangements with other UK and International centres. 	Description of policy and practice	Annual	Science centres

Strategic Objective: Educational quality			
KPI	Measure	Method	Lead
Link to educational quality national Standards	<ul style="list-style-type: none"> • HMIE rating. • Participation in DCFS 'Learning outside the classroom' pilot. 	HMIE Inspection report	HMIE
Complement the formal science Curriculum	<ul style="list-style-type: none"> • Approach to learning environment consistent with Curriculum for Excellence. 	Teacher peer review	Science centres
Impact on learning outcomes	<ul style="list-style-type: none"> • Pledge for learning. 	Outcome measures?	Science centres

Strategic Objective: Visitor satisfaction			
KPI	Measure	Method	Lead
Science centre experience	<ul style="list-style-type: none"> • Overall experience: enjoyment, inspiration, fun, thought provoking. • Why visit? • What did you see? • What were the facilities like? • Did it relate to everyday life? • Satisfaction with exhibition/exhibits. • Did you feedback comments? How might you feedback? • Would you visit again? • Would you recommend to others? 	Survey	OCR
Tourist branding	VisitScotland rating.	Rating system	VisitScotland

Strategic Objective: Accessible to all				
KPI	Measure	Method	Frequency	Lead
Visitor attendance on site	<ul style="list-style-type: none"> Children (0-16). Adults (17-25), (26-64). Older people (65+). 	Ticketing software	Ongoing	Science centres
Visitor demographic	<ul style="list-style-type: none"> Socio/economic group (postcode) + other indicators (occupation, housing tenure, education). Resident/tourist. Visitor constituency (who is with you?). Have you been before? How did you get here? Self identified ethnicity. 	Survey	Annual	OCR

Library and Information Services
 University of Wales Institute, Cardiff
 100 Chester Avenue

CF23 9XR

9.2.1 Implementation timetable

In recognising the difficulty associated with measuring learning impacts and outcomes in science centres OCR created a timetable for implementation of their evaluation framework in which the development and implementation of these measures takes place towards the end of the current three year funding term (2008-2011). Shown in table 9.3 the early stages of the Government's framework are still on target for delivery. The table demonstrates a continued emphasis on SSCN reporting against output measures and an adoption of qualitative and outcome measures to be administered by OCR.

Table 9.3 Implementation timetable

Action	Lead	Date
Quarterly reporting on visitor numbers (Q1 + Q2)	SSCN	Oct 2008
First bi-annual SSCN visitor survey	OCR	
Quarterly reporting on visitor numbers (Q3)	SSCN	Jan 2008
Science careers omnibus survey	OCR	
Quarterly reporting on visitor numbers (Q4)	SSCN	April 2009
Annual narrative on policy and practice	SSCN	
Second bi-annual SSCN visitor survey	OCR	
Annual Scottish Science omnibus survey	OCR	
Baseline April 2009		
Quarterly reporting on visitor numbers (Q1)	SSCN	July 2009
Quarterly reporting on visitor numbers (Q2)	SSCN	Oct 2009
First bi-annual SSCN visitor survey	OCR	
Quarterly reporting on visitor numbers (Q3)	SSCN	Jan 2009
Quarterly reporting on visitor numbers (Q4)	SSCN	April 2010
Annual narrative on policy and practice	SSCN	
Second bi-annual SSCN visitor survey	OCR	
Annual Scottish Science Survey	OCR	
1st year April 2010		
Quarterly reporting on visitor numbers (Q1)	SSCN	July 2010
Quarterly reporting on visitor numbers (Q2)	SSCN	Oct 2010
First bi-annual SSCN visitor survey	OCR	
SSCN Review	OCR	
Quarterly reporting on visitor numbers (Q3)	SSCN	Jan 2011
Science careers omnibus survey	OCR	
Quarterly reporting on visitor numbers (Q4)	SSCN	April 2011
Annual narrative on policy and practice	SSCN	
Second bi-annual SSCN visitor survey	OCR	
Annual Scottish Science Survey	OCR	
2nd year March 2011		

9.3 A COMPARISON OF FRAMEWORKS

The submission of my own investigation's performance and accountability framework (see table 7.6, 7-24) to the Scottish Government in late March 2008 and subsequent appearance of a new *evaluation* framework from the Government in late June 2008 warrants comparison in efforts to determine whether the Scottish Government's thinking was influenced by my research and if so, to what extent and if not, why not, given OCSA's request in February 2008 that the SSCN develop a common performance management framework.

The comparison identifies striking similarities between the two frameworks and provides almost irrefutable evidence that my investigation's output has heavily influenced the framework now adopted and being implemented by the Scottish Government.

The Government's framework includes eleven KPIs. These map almost directly onto the first fourteen KPIs of my investigation's framework with the exception that the OCR framework includes a KPI based on the public's awareness and use of the SSCN centres. While usage levels were factored as a KPI in my investigation, awareness was not. Its inclusion in the Government's framework makes a great deal of sense given Scottish ministers' likely desire to see the profile of SSCN centres raised as a result of receiving Government funds. Raised awareness of the SSCN also supports a corollary for raised awareness of science in society, another priority of the Government. The only other variation in these first KPIs is that the OCR framework specifically highlights the importance of sound science: ensuring quality of science content. While not specifically mentioned in my framework the inclusion of KPIs linked with HMIE rating, learning outcomes based KPI for education visitors, number of knowledge transfer partnership with HEIs and number of knowledge-transfer based exhibits hosted by SSCN centres provides strong inference to the importance of sound science content. A comparison of these KPIs is shown in table 9.4.

Table 9.4 A comparison of KPIs

Scottish Government KPIs	SSCN KPI
Promote awareness and use of science (centres)	0 – the OCR KPI is linked with awareness of the science centres themselves
Up-take of science careers	12
Sound science: Ensuring quality of science content	0 – ‘assumed’ through delivery of KPIs 9, 10, 13 & 14
Contemporary science: Promotion of cutting edge science and innovation	13-14
Link to educational quality national standards	9
Complement the formal science curriculum	11
Impact on learning outcomes	10
Science centre experience	7-8
Tourist branding	8
Visitor attendance on-site	1-3
Visitor demographic	4-6

The last three KPIs in the framework I submitted to the Government in March 2008 were all linked with demonstrating VFM in return receiving public funding. These KPIs were included following repeated references by the Scottish Government for the need to recognise its importance. In this regard it is perhaps surprising that the OCR makes no reference to VFM or indeed any measure associated with fiscal economy, efficiency or effectiveness.

In addition to content the structure of frameworks also bare strong similarity with both having column headings of strategic objectives, KPI’s, measure/methodology and frequency. The OCR evaluation framework contains an additional heading ‘lead’ in signalling organisational responsibility for each KPI whether SSCN, OCR or NGO.

9.4 NEXT STEPS

While clearly showing the influence of my own investigation the OCR’s evaluation framework also importantly shows a development in the Government’s thinking and an advancement in the framework which brings it much nearer to completion. While outcome-based evaluation measures have yet to be settled on or implemented the OCR framework

demonstrates a commitment to doing so. Perhaps most importantly the Government have now adopted a model and are in the process of implementing it. The framework developed through my own investigation shares further similarity to that of the OCR model in that both were always viewed as works in progress, the beginning of establishing something meaningful rather than an end point. With baseline data, predominantly output and qualitative (in terms of the visitor experience and awareness of centres) in nature, now being collected the next steps for the OCR lie in how it establishes and implements a small number of outcome or impact based indicators which in the fullness of time have the potential to influence developments around the PES-based effectiveness of the SSCN centres.

Once fully implemented an independent review of the Government's evaluation framework would be beneficial in determining its overall effectiveness in capturing the difference being made by the SSCN in return for public funding while also highlighting opportunities for further improvement.

REFERENCES

REFERENCES

- Baskaran, A. & Boden, R., 2004. Science: A Controversial Commodity. *Science Technology and Society*, 9, 1-26.
- Baskaran, A. & Boden, R., 2007. Prometheus Bound: Accounting and the Creation of the New Science Paradigm. *International Studies of Management and Organisation*, 37 (1), 9-26.
- BBC, 2003. Big Idea Facing Closure. *BBC News*, 21 August. Available from: <http://news.bbc.co.uk/1/hi/scotland/3171669.stm> [Accessed 8 May 2006].
- Beetlestone, J.G., Johnson, C.H., Quin, M. & White, H., 1998. The Science Centre Movement: contexts, practice, next challenges. *Public Understanding of Science*, 7, 5-26.
- Bell, P., Lewenstein, B., Shouse, A.W. & Feder, A.F., 2009. *Learning Science in Informal Environments: People, Places and Pursuits*. Washington D.C.: Report of the Committee on Learning Science in Informal Environments, National Research Council of the National Academies.
- Boden, R., Cox, D. & Nedeva, M., 2006. The Appliance of Science? New Public Management and Strategic Change. *Technology Analysis & Strategic Management*, 18 (2), 125-141.
- Callon, M., 1994. Is Science a Public Good? *Science, Technology and Human Values*, 19, pp. 395-424.
- Caulton, T., 1998. Performance Matters: Measuring the operational success of interactive centres. Available from <http://www.tcaulton.myzen.co.uk/Tim%20Caulton%20ECSITE%20article.pdf> [Accessed 19 December 2006].
- Coghlan, D. & Brannick, T., 2005. *Doing Action Research in Your Own Organisation* (2nd ed.). London: SAGE Publications.
- Department for Culture, Media and Sport, 1999. *Efficiency and Effectiveness of Government-sponsored Museums and Galleries: Measurement and Improvement*. London: Prepared by Deloitte and Touche.
- Department of Trade and Industry (DTI), 1993. *Realising Our Potential: A Strategy for Science, Engineering and Technology*. London: HMSO.
- ECSITE-UK, 2002. *Science and Discover Centres: Capitalising on 20 Years' Investment*. London: ECSITE-UK.
- ECSITE-UK, 2008a. *Inspiration, Engagement and Learning: The Value of Science & Discovery Centres in the UK*. London: ECSITE-UK.

- ECSITE-UK, 2008b. *The Impact of Science & Discovery Centres: A Review of Worldwide Studies*. London: ECISTE-UK.
- Edwards, C., 2004. Evaluating European Public Awareness of Science Initiatives. *Science Communication*, 25 (3), 260-271.
- Elam, M. & Bertilsson, M., 2003. Consuming, Engaging and Confronting Science: The Emerging Dimensions of Scientific Citizenship. *European Journal of Social Theory*, 6 (2), 233-251.
- Evans, G. & Durant, J., 1995. The relationship between knowledge and attitudes in the public understanding of science in Britain. *Public Understanding of Science*, 4, 57-74.
- Falk, J.H. & Dierking L.D., 2000. *Learning from Museums*. Walnut Creek, CA: Altamira Press.
- Gammon, B. & Harris, 2006. Unpublished survey of UK science and discovery centres conducted on behalf of ECSITE-UK. IN: *Inspiration, Engagement and Learning: The Value of Science & Discovery Centres in the UK*, 2008. London: ECSITE-UK.
- Gibbons, M., 1999. Science's New Social Contract with Science. *Nature*, 402, 11-17.
- Glaser, B.G., 1978. *Theoretical Sensitivity: Advances in the Methodology of Grounded Theory*. Mill Valley, CA: Sociology Press.
- Halcrow Group Limited, 2007. *Scotland's Science Centres: Impacts and Future Interventions*. Edinburgh: Scottish Government Social Research.
- HMIE, 2002. *Review of the Contribution of Scottish Science Centres to Formal and Informal Science Education*. Unpublished report.
- HMIE, 2007. *Review of the Contribution of Scottish Science Centres to Formal and Informal Science Education*. Livingston: HMIE.
- House of Commons Science and Technology Committee, 2007. *The Funding of Science and Discovery Centres*. Eleventh Report of Session 2006-07, Volume I. London: The Stationary Office.
- House of Lords Select Committee on Science and Technology, 2000. *Science and Society*. Third Report. Available from: <http://www.parliament.the-stationery-office.co.uk/pa/ld199900/ldselect/ldscstech/38/3801.htm> [Accessed 6 July 2006].
- Irwin, A., 2001. Constructing the scientific citizen: science and democracy in the biosciences [Electronic version]. *Public Understanding of Science*, 10, 1-18.
- Jacob, M., 2003. Rethinking Science and Commodifying Knowledge. *Policy Futures in Education*, 1 (1), 125-142.

- Johnson, C., 2005. *Science Centers as Learning Environments*. Available from: http://www.astc.org/resource/education/johnson_scicenters.htm [Accessed 7 June 2006].
- Jura Consultants, 2003. *Scottish Museums Council: Performance Management in Museums*. Edinburgh: Report commissioned by the Scottish Museums Council on behalf of the Scottish Executive.
- Jura Consultants, 2004a. *Development of the Concept for a National Science Centre* (March 2004). Edinburgh: Jura Consultants, commissioned by the Scottish Executive.
- Jura Consultants, 2004b. *Development of the Concept for a National Science Centre – Extracts for Sensation* (May 2004). Edinburgh: Jura Consultants, commissioned by the Scottish Executive.
- Lawley, I., 2003. Local Authority Museums and the Modernising Government Agenda in England. *Museum and Society*, 1 (2). Available from: <http://www.le.ac.uk/ms/m&s/issue%202/mslawley.pdf> [Accessed 19 October 2006].
- Lewin, K., 1946. Action Research and Minority Problems. *Journal of Social Sciences*, 2, 34-46.
- Marshall, G., 1998. *A Dictionary of Sociology*. New York: Oxford University Press.
- McDermid, D., 2006. *Varieties of Pragmatism: Truth, Realism, and Knowledge from James to Rorty*. London: Continuum.
- Miller, S., 2001. Public understanding of science at the crossroads. *Public Understanding of Science*, 10, 115-120.
- Morris, Hargreaves and McIntyre, 2007. *Balancing the Scorecard: Review of DCMS Performance Indicator Framework*. Manchester: Report commissioned by the Department for Culture, Media and Sport.
- Office of Science & Technology and the Wellcome Trust, 2000. Science and the Public: A Review of Science Communication and Public Attitudes Toward Science in Britain [Electronic version]. *Public Understanding of Science*, 10, 315-330.
- Optimising Public Understanding of Science and Technology in Europe. University of Vienna, Final Report to the European Commission, OPUS project, Raising Public Awareness programme, DG Research, contract no. HPRP-CT-1999-00012, June 2003. Available from: <http://www.univie.ac.at/virusss/OPUSReport/index.html> [Accessed 19 December 2006].
- Parliamentary Office of Science and Technology, 1995. POSTnote: *Public Attitudes to Science*, 69. Available from: <http://www.parliament.uk/post/pn069.pdf> [Accessed 24 November 2006].

Parliamentary Office of Science and Technology, 2000. POSTnote. *Science Centres*, 143. Available from: <http://www.parliament.uk/post/pn143.pdf> [Accessed 5 June 2006].

Parliamentary Office of Science and Technology, 2001. *Opening Channels: public dialogue in science and technology*, 153. Available from <http://www.parliament.uk/post/pr153.pdf> [Accessed 27 June 2006].

Parliamentary Office of Science and Technology, 2002. POSTnote: *Public Dialogue on Science and Technology*, 189. Available from: <http://www.parliament.uk/post/pn189.pdf> [Accessed 27 June 2006].

Parliamentary Office of Science and Technology, 2006. POSTnote: *Debating Science*, 260. Available from: <http://www.parliament.uk/documents/upload/postpn260.pdf> [Accessed 3 August 2006].

Parliamentary Office of Science and Technology, 2007. POSTnote: *Strategic Science*, 277. Available from: <http://www.parliament.uk/documents/upload/postpn277.pdf> [Accessed 21 February 2007].

Persson, P., 2000. Science centres are thriving and going strong. *Public Understanding of Science*, 9, 449-460.

Prime Ministers Speeches, 2002. *Science Matters*. Available from: www.number-10.gov.uk/output/Page1715.asp [Accessed 5 July 2006].

Prime Ministers Speeches, 2006. Our Nation's Future – Science. Available from <http://www.number10.gov.uk/Page10342> [Accessed 5 June 2006].

Royal Society, 1985. *The Public Understanding of Science*. London: Royal Society.

Ryder, J., 2002. Leadership in Museums: Are our Core Values Shifting? Keynote paper presented at the *INTERCOM* conference, 16-19 October 2002 Dublin.

Scottish Museums Council, 1998. *Best Value for Museums: A Corporate Approach*. Edinburgh, 8.

Scottish Museums Council, 2002. *The Collective Insight, the National Audit of Scotland's Museums and Galleries*. Edinburgh: Scottish Museums Council.

Scottish Science Centres Network: 2005-09. A four-year strategy developed by the four Scottish Science Centres in Partnership with the Scottish Executive (2005). Scottish Executive (www.scotland.gov.uk/Publications/2005/12/06113103/31040).

Stein, J.A., 2003. Public Understanding of Science and the Policy Context in the United Kingdom, Chapter 2, PUS Policies. In, *Optimising Public Understanding of Science and Technology in Europe*. University of Vienna, Final Report to the European

Commission, OPUS project, Raising Public Awareness programme, DG Research, contract no. HPRP-CT-1999-00012, June 2003. Available from: <http://www.univie.ac.at/virusss/OPUSReport/index.html> [Accessed 19 December 2006].

Stehr, N., 1994. *Knowledge Societies*. London: Sage.

Sturgis, P. & Allum, N., 2004. Science in Society: Re-evaluating the deficit model of public attitudes. *Public Understanding of Science*, 13, 55-74.

Willmott, H., 1995. Managing the Academics: Commodification and Control in the Development of University Education in the U.K. *Human Relations*; 48 (9), 993-1027.

Wilsdon, J., 2005. Small Talk: New Ways of Democratising Science and Technology. Available from: http://www.opendemocracy.net/globalization-accountability/science_2871.jsp [Accessed 6 February 2007].

Wynne, B., 1992. Public Understanding of Science Research: New Horizons or Hall of Mirrors? [Electronic version]. *Public Understanding of Science*, 1, 37.

Yin, R.K., 2002. *Case Study Research: Design and Methods* (3rd ed.). Beverly Hills: Sage Publications.

APPENDIX 1

RESEARCH CONTACT SHEET – PHASE ONE INTERVIEWS

Name	Title	Organisation	Affiliate Organisation	Country	E-mail	Telephone	Invited	Twice	Decision	Interview date / time	Completed
Sharon Vincent	Director of Public Engagement	The Natural History Museum		England	s.vincent@nhm.ac.uk	+1207 949 5831	Y		N		
Judy Guillaume	Chief Executive	La Cité des Sciences & de l'Industrie		France	g.bouge@cite-sciences.fr	+331 40 05 82 40	Y	Y	Y	27/09/07 at 09:00	Y
Iren Alan	Chief Executive	SciTech		Australia	alenn@scitech.org.au	+61192150701	Y		Y		
Ruce Isabel	Head of Science and Society Team	Scottish Government		Scotland	isabel.bruce@scotland.gsi.gov.uk	0141 242 0189	Y	Y	Y		
Lucretia Michiel	General Director	NEMO		Netherlands	buchel@nemo.nl	0031204963153	Y	Y	Y	28/09/07 at 10:30	Y
Lucretia Michiel	Executive Director	Cité de l'espace		France	luc@citel.fr	0033552716484	Y	Y	Y		
Arvidish Kim	Chief Executive	Museum and Discovery Centre, Ft. Lauderdale	ASTC	USA	arvidish@museumdiscovery.com	001 854 713 0800	Y	Y	Y	30/11/07 at 15:00	Y
Jonathan Linda	Chief Executive	Life	ECSSITE-UK / ECSITE	England	linda@life.org.uk	0117 915 1766 / 0798 733 4156	Y	Y	Y	18/10/07 at 14:00	Y
Jellicoe Goey	Chief Executive	Al-Bustan	ECSSITE-UK	Australia	goey@al-bustan.com.au	021 6270 2801 / 021 6242 6014	Y	Y	Y	27/09/07 at 15:45	Y
Jurant Graham	Director	Questron	ASTC	USA	gjurant@questron.com	+1 917 882 6671	Y	Y	Y	27/10/07 at 11:00	Y
Freeman Alan	Former CEO NY Hall of Science			London	alan@nyhall.com	0207 942 4512	Y	Y	Y		
Say Homer	Head of Learning	Natural History Museum		Denmark	h.say@nhm.ac.uk	04539257265	Y	Y	Y		
Radstone Harvey Kim	Director of Science Communication	Experimentarium		The Netherlands	kim@experimentarium.nl	+31456578021	Y	Y	Y		
Hubbels Hans	General Director	Experimentarium	ECSSITE	France	h.hubbels@experimentarium.com		Y	Y	Y		
Richard Jack	General Director	Palais de la découverte	ECSSITE	France	jack.richard@palais-decouvertes.fr		Y	Y	Y		
Herbert Jean-Francois	President	La Cité des Sciences & de l'Industrie	ECSSITE	France	herbert@cite-sciences.fr		Y	Y	Y		
Joerg Asger	Executive Director	Experimentarium	ECSSITE	Denmark	joerg@experimentarium.dk		Y	Y	Y	01/10/07 at 12:30	Y
Boyle Robin	Scientific Director	Glasgow Science Centre	ASTC	Scotland	roboyle@glasgowsciencecentre.org	0141 420 5010 ext 318	Y	Y	Y	21/12/07 at 11:00	Y
Thompson Chevy	President & CEO	Arizona Science Center	ASTC	USA	chevy@arizona-science.org		Y	Y	Y	26/10/07 at 13:00	Y
Jacquelyn Wyn	President & CEO	Technopolis	ASTC	Belgium	syn@technopolis.be	+3221 534 2020	Y	Y	Y	31/10/07 at 16:30	Y
Johnson Colin	Former Techniquiest CEO			Wales	colin.johnson@nwrd.com	+442920942532	Y	Y	Y		
Riger Gerhard	Director	DASA	ECSSITE	Germany	gerhard.riger@das.de	+49 231 9071 2660	Y	Y	Y		
Kokkeler Ben	Board of Governors	Cosmos Science Center	ECSSITE	Netherlands	ben.kokkeler@cosci.nl	+316 10723379	Y	Y	Y	28/09/07 at 12:30	Y
Kos Miha	Director	House of Experiments	ECSSITE	Slovenia	miha.kos@h-e.si		Y	Y	Y		
Koster Emlyn	President / CEO	Liberty Science Centre	ASTC	USA	emlyn.koster@liberty-science.org	+141566953100	Y	Y	Y	21/12/07 at 15:00	N
Lewis Lesley	Director General & CEO	Ontario Science Centre	ASTC	USA	lesley.lewis@osc.on.ca	+17055223701	Y	Y	Y	08/11/07 at 15:00	Y
Marchbank Jim	Chief Executive	Science North	ASTC	USA	jim.marchbank@scicenorth.ca	+1361 286 1481	Y	Y	Y	18/11/07 at 15:00	Y
Matskasi Ishan	Director General	Hungarian Natural History Museum	ECSSITE	Hungary	ishan.matskasi@nhmus.hu	0207 7942 4372	Y	Y	Y		
Wilne Sira	Chief Executive	Science Museum	ECSSITE-UK	England	sira.wilne@science-museum.org.uk	0131 523 1230	Y	Y	Y	18/12/07 at 11:00	Y
Montgomery Sally	Chief Executive	Our Dynamic Earth	ECSSITE-UK	Scotland	sally.montgomery@odeneath.co.uk	0131 523 1230	Y	Y	Y	18/12/07 at 11:00	Y
Pearson Paul-Edwin	Director	W5	ECSSITE / ASTC	Northern Ireland	paul@w5scotland.com	02890 457777	Y	Y	Y	24/09/07 at 13:30	Y
Pearl Camille	Director	Heureka	ECSSITE / ASTC	Finland	pearl@heureka.fi	+358 9 8579 201	Y	Y	Y	25/10/07 at 12:00	Y
Quin Melanie	Former ECSSITE-UK CEO	Royal Belgian Institute of Natural Sciences	ECSSITE	Belgium	melanie.quin@ribo.be	+3225274259	Y	Y	Y	12/11/07 at 15:00	Y
Ramsay Kirk	Chief Executive	Glasgow Science Centre	ECSSITE	Scotland	kirk.ramsay@glasgowsciencecentre.org		Y	Y	Y	16/10/07 at 11:00	Y
Saidi Bryce	Chief Executive	Pacific Science Center	ASTC	USA	bryce.saidi@psci.org	0141 420 5038	Y	Y	Y	19/12/07 at 13:30	Y
Simmons Ian	Director, Science Communication	Life	ASTC	England	ian.simmons@life.org.uk	0181 2438250	Y	Y	Y	19/11/07 at 17:00	Y
Simpson John	Chief Executive	Our Dynamic Earth	ASTC	Scotland	john.simpson@odeneath.co.uk	0131 523 1265	Y	Y	Y	28/09/07 at 16:30	Y
Sluober Nancy	President & CEO	Cropus Museum of Science and Industry	ASTC	USA	nsluober@omsi.edu	001 305 646 4253	Y	Y	Y	09/11/07 at 15:00	Y
Thomas Gillian	President & CEO	Miami Museum of Science & Planetarium	ASTC	USA	gthomas@miamisci.org	+1305 861 1917 4400	Y	Y	Y		
Tobiana Marijuel	Director	Museo de las Ciencias Príncipe Felipe	ECSSITE	Spain	marijuel@ciencias.com		Y	Y	Y	29/09/07 at 15:30	Y
Trewitt Peter	Chief Executive	Techniquiest	ECSSITE-UK	Wales	pete@techniquiest.org	02920 475 451	Y	Y	Y		
Vargas Rosalia	Director	Pavilion of Knowledge - Ciencia Viva	ECSSITE	Portugal	rvargas@pavconhecimento.mct.pt		Y	Y	Y		
Wint Dennis	President and CEO	The Franklin Institute	ECSSITE-UK	USA	dennis@fritmc.com	+1215 448 1146	Y	Y	Y		
Winterbottom Nick	Chief Executive	Thinktank	ECSSITE-UK	England	nick.winterbottom@thinktankpoint.org.uk	0121 2022213	Y	Y	Y	18/10/07 at 09:00	Y

APPENDIX 2

INVITATION TO POTENTIAL INTERVIEWEES

Questionnaire – covering letter

Dear Colleague,

I am currently undertaking doctoral research on science centre sustainability. In particular, I am investigating how government funding and performance management systems for science centres could be used to better facilitate government policy on public engagement with science?

In 2003 the Scottish Executive committed considerable financial resource to supporting Scotland's four science centres (Glasgow Science Centre, Edinburgh's, Our Dynamic Earth, Aberdeen's, Satrosphere Science Centre and Dundee's, Sensation), in what it described as a 'something-for-something' investment. As the resulting Scottish Science Centres Network (SSCN) matures, this funding is likely to be increasingly linked to its delivery against government policy towards public understanding and more commonly, public engagement with science.

My research aims to develop a consensus framework that would be useful to the SSCN in its efforts to better fulfill this growing requirement. It is hoped that the findings of this study have transferability beyond the Scottish context, and in this regard I would be happy to share a summary of my findings with you in return for your participation.

Your experience of working in the science centre field, seniority of role within your organisation and other factors such as peer election to science centre membership organisations e.g. ECSITE, ASTC, etc all prompted me to write to you to ask if you would be so kind as to assist me in my research.

I plan to use a combination of telephone interviews and electronic-based questionnaire as collectively these methods best afford ease of response from a geographically dispersed and sizeable sample, analysis of subsequent data set and maintaining the anonymity of respondents. Three rounds of questioning are anticipated, with each data set informing the next. Only the members of the SSCN will be questioned in the final round as achieving consensus will be critical to the process. Confidentiality of all individuals will be maintained throughout the data collection exercise and individual responses will only be viewed by me and my doctorate supervisors.

I do recognise the many demands you will have on your time but also feel the outputs of this study could be of some importance to your own organisation and our sector more widely. I will endeavour to keep any commitment on your time to a minimum.

If you have any questions I would be very happy to answer these and can be contacted on +441382868606 or at paul.jennings@sensation.org.uk. If willing to participate could you please send me a brief confirmation of this along with a contact telephone number. I will contact you in advance of the interview to arrange a convenient day and time.

Thank you for taking the time to consider my request, I do hope you will be able to participate in this work.

Yours sincerely,

Paul Jennings
Chief Executive

APPENDIX 3

RESEARCH CONTACT SHEET – PHASE TWO INTERVIEWS

Research contact sheet - phase 2 interviews

Name	Title	Organisation	Affiliate Organisation	Country	Email	Telephone	Invited	Decision	Interview date / time	Completed
Brian Alan	Chief Executive	Sci Tech		Australia	blamb@schec.org.au	(0061) 8 82150701	Y	Y	04/02/08 at 8am	Y
Jawandish Kim	Chief Executive	Museum and Discovery Centre, Ft. Lauderdale	ASTC	USA	kwavendish@moods.net	(001) 954 713 0960	Y	Y	17/01/08 at 4pm	Y
Jonian Linda	Chief Executive	Life	ECSITE-UK / ECSITE	England	linda@life.org.uk	0191 243 6205	Y	Y	15/01/08 at 10am	Y
Jacquie Goary	Chief Executive	Al-Bireh	ECSITE-UK	England	goary.j@al-bireh.org.uk	0117 915 7156 / 0796 733 4155	Y	Y	18/01/08 at 2pm	Y
Zurani Graham	Director	Questacon	ASTC	Australia	zurani@questacon.gov.au	(0061) 2 6242 6014	Y	Y	29/01/08 at 11am	Y
Fredman Alan	Former CEO NY Hall of Sciences	Independent science centre consultant		USA	alanfredman@verizon.net	(001) 917 882 8871	Y	Y	18/01/08 at 2:00pm	Y
Joëg Asper	Executive Director	Experimentarium	ECSITE	Denmark	joeg@experimentarium.dk	(+45) 3927 3333	Y	Y	01/02/08 at 1pm	Y
Joyce Robin	Scientific Director	Glasgow Science Centre		Scotland	robin.joyce@gov.sc.nhs.uk	0141 420 5010 ext 319	Y	Y	14/01/08 at 5am	Y
Jacquelyn Erik	President & CEO	Techropolis	ASTC	Belgium	erik@techropolis.be	(+32) 21 534 2020	Y	Y	16/01/08 at 10am	Y
Jimson Colin	Former Techrequest CEO	Independent science centre consultant	snw@ball selected	Wales	colin.jimson@ballworld.com	(+44) 029 20842332	Y	Y	29/01/08 at 2pm	Y
Cosier Evelyn	President / CEO	Liberty Science Centre	ASTC	USA	evelyn@liberty-sc.org	(001) 201 253 1201	Y	Y	18/01/08 at 3:30pm	Y
Jewis Lesley	Director General & CEO	Ontario Science Centre	ASTC	USA	lesley.jewis@osc.on.ca	(001) 416 866 8100	Y	Y	04/02/08 at 3pm	Y
Archerbank Jim	Chief Executive	Science North		Canada	jim@science-north.ca	(001) 705 522 3701 ext 2105	Y	Y	29/01/08 at 9am	Y
Montgomery Sally	Scientific Director	Our Dynamic Earth	ECSITE-UK	Scotland	sally.montgomery@odm.sc.nhs.uk	0131 523 1230	Y	Y	17/01/08 at 9am	Y
Peresson Per-Edwin	Chief Executive	WS		Northern Ireland	per@ws.com	02839 467177	Y	Y	22/01/08 at 12 noon	Y
Ramsay Kirk	Chief Executive	Heureka	ECSITE / ASTC	Finland	kirk.ramsay@heureka.fi	(+358) 9 8579 201	Y	Y	31/01/08 at 2:30pm	Y
Sadi Bryce	Chief Executive	Glasgow Science Centre		Scotland	bryce.sadi@gscsc.org	0141 420 5038	Y	Y	16/01/08 at 5pm	Y
Simson John	Chief Executive	Pacific Science Center	ASTC	USA	john.simson@pacificsci.org	(001) 206 443 2888	Y	Y	29/01/08 at 4pm	Y
Trevitt Peter	Chief Executive	Our Dynamic Earth		Scotland	peter@odm.sc.nhs.uk	0131 523 1285	Y	Y	17/01/08 at 9:30am	Y
Winterbotham Nick	Chief Executive	Technquest	ECSITE-UK	Wales	nick@technquest.org	02920 475 481	Y	Y	17/01/08 at 10:30am	Y
		Thinktank	ECSITE-UK	England	nick.winterbotham@thinktank.ac.uk	0121 2022213	Y	Y		

Group meeting re-scheduled for 26/02/08 at noon at Our Dynamic Earth

APPENDIX 4

INTERVIEW ONE – QUESTION SCHEDULE

Outline interview (question schedule)

Existing funding relationships with government

1. Does your science centre have an existing relationship with government? If so, can you please describe this?
2. What are the benefits (or consequences) to government of working with your science centre?
3. What is the benefit (or consequence) to your science centre of working with government?
4. Is any reporting of performance required? If so who sets the criteria, what performance indicators are reported, who defines them and how robust / reliable are they?

Funding mechanism

5. Are you aware of any other funding models and associated performance criteria between other governments and their science centres? Are you able to describe these or comment on their effectiveness?
6. What do you think governments should be seeking in return for funding?
7. Where more than one science centre exists in a country do you think it is possible to be equitable in distributing funds? If so, how could this be best achieved?
8. Is equity of funding desirable in all instances? If not, how else is 'fairness' achieved?
9. What place, if any, does 'value for money' have in a funding relationship between governments and science centres? How, if of significance, is value best demonstrated?

Performance Indicators

10. What should a performance framework for science centres look like?
11. Is a common performance framework (when applied to more than one science centre) feasible?
12. What role, if any, should government play in setting / agreeing performance indicators?
13. What significance should government place against delivery or non-delivery of performance indicators?
14. Are you aware of any 'proven' performance indicators for science centres? If so, can you describe these or direct to others who use them?

15. How might a balance between indicators which are meaningful and consequential be balanced against indicators which are easily measured?
16. Are there themes around which performance indicators should be agreed?
17. How often should performance be reviewed, recorded, reported?
18. How is 'robustness' of performance measured best demonstrated?

APPENDIX 5

INTERVIEW STRUCTURE

Interview structure

- Welcome
- Ask interviewee if they are ok with being recorded?
- All recordings will remain confidential and only shared with others who are involved in assessing work. Any transcript of the tapes (if made) will be shared with interviewee to check for accuracy. These transcripts will not form part of the final published document and so will remain confidential.
- Is interviewee ok being quoted in final thesis? Where interviewee is effectively representing a country or devolved government e.g. Wales, Northern Ireland, are they happy with the wider context which they describe being included, potentially in the form of a case study?

Set Scottish context.

Ask questions (from schedule).

- Does the interviewee have any documentation they would wish to provide as additional information?
- Thank interviewee for their time.
- Based on the interview and line of questioning does the interviewee know of any other senior science centre personnel who should be contacted (snowballing)?
- Ask interviewee if willing to respond to any follow up questions that come out of the wider interview process, take part in a second interview or possible questionnaire once phase 1 of research is completed?
- Inform that hope to complete data gathering exercise before the end of the year and write this up for an April submission.
- Would interviewee like to be sent a summary of report when study is concluded?

APPENDIX 6

INTERVIEW TWO – QUESTION SCHEDULE

Doctorate Interview 2 – Question Schedule

Context

1. Is it possible for science centres to influence government policy related to public engagement with science (PES)? If so, what factors must be present? Are you aware of any evidence of this?
2. How might the work of science centres in PES support wider government policy on science?
3. Who (other than government) are the major stakeholders / agencies that science centres should be working with in delivering their science learning / PES agenda?
4. Which are the main government departments that have an interest in PES?

Mechanism

5. What are the main variables between different science centres? Is there scope to moderate for these in establishing comparable key performance indicators (KPIs)?
6. Can you identify any KPIs for which *comparability* across science centres should be possible?
7. Can you identify any KPIs for which comparability is difficult but which should be expressed in any performance framework anyway?
8. Should any performance framework for a network of science centres be exclusively network, exclusively individual or a combination of both in focus?

Measurement

9. Three main areas, against which to consider performance, emerged out of the round one interviews. These were **social** or visitor related, **intellectual** or those related to the science centre as a learning environment and **financial**. Can you identify a minimum of two possible key performance indicators for each? Do you feel these strands are appropriate ones? Are there others?
10. Should there be one or more levels of indicators? Please explain.
11. Can you describe your institutions definition of a visitor – for reporting purposes?
12. Are there different categories of visitor that should be considered?
13. Is an emphasis on visitor numbers (by government) likely to have positive, negative or neutral effects on science centre behaviour? Please describe.
14. Can *engagement, attitudinal change or learning* be demonstrated / measured during (or after) a science centre visit? Is any associated methodology likely to be reliable?
15. Should specific performance expectation be clearly defined at the outset of an agreement with government or be set within a range of parameters?

Evaluation

16. Can you identify common areas of activity between science centres where a common evaluation might be possible?
17. Who is best placed to evaluate / interpret any shared key performance indicators *intelligently* for science centres?
18. What should happen with this interpretation?

APPENDIX 7

SCOTTISH EXECUTIVE FUNDING ANNOUNCEMENT 2004



SCOTTISH EXECUTIVE

Enterprise, Transport & Lifelong Learning Department
Higher Education and Science Division

Europa Building
450 Argyle Street
Glasgow G2 8LG

Mr Paul Jennings
Chief Executive
Sensation
Dundee Science Centre
Greenmarket
Dundee
DD1 4 QB

Telephone: 0141-242 0188
Fax: 0141-242 0193
Andy.bishop@scotland.gsl.gov.uk
<http://www.scotland.gov.uk>

27 May 2004

Dear Paul

You will have recently received from Jura Consultants the extracts from their report to us in relation to your own centre. I hope that you will find these useful and will agree that they are firm basis for establishing a public funding strategy for the centres.

I am writing to set out some positive developments on funding and to seek confirmation that you are content with how we intend to develop these plans over the next 6 months or so. We also plan to outline this progress in an announcement shortly.

You will be pleased to learn that the Scottish Executive intends to make funding available to the 4 centres in 2004-05, which is based closely on the various support measures recommended by Jura. Plans are also well developed for similar funding for 2005-06. Beyond this, we are considering in the Executive's comprehensive spending review whether to establish within the Executive a specific budget for the 4 centres. The outcome of the spending review will not be known until September at the earliest, but in the meantime we would like to announce the progress made so far.

You will appreciate that all of this funding has had to be found from savings in the Executive's other budgets, and against strongly competing bids. More negotiations are ahead in the spending review. Ministers are therefore very concerned that this hard-won funding is put to best effect, and that the recommendations of the Jura report on business improvements and strategic development of the centres are implemented with due speed.

Funding by the Executive is not intended to replace funding by other public and private sponsors but to ensure continued viability of the centres in relation to the Executive's long term strategic needs.

Some of the business improvements set out by Jura cover all the centres, and some are specific to particular centres. At an overall level, Ministers have accepted Jura's recommendation that the centres should not be merged under a National Science Centre, in

view of the legal difficulties involved and lack of a clear business case for this. The centres will therefore retain their individual autonomy. However, the centres will need to work collaboratively on a number of issues, to share best practice and to work to common standards. At a specific level, there are a number of improvements needed which are covered in the Jura report, and we have retained the services of Jura for the next 6 months at least to enable us to work with you on putting this plan into effect.

While it is appreciated that further negotiation will be needed over the coming months on the detail of these improvements, we do need you to accept the main terms under which such negotiations will proceed, and that payments of grant from the Executive are contingent on adequate progress being made on negotiations and implementation.

Once you have accepted these overall terms we intend to announce this, and then proceed to work up a firm offer of support. Jura Consultants will also be in contact with you again outlining plans for their discussions with you and monitoring requirements, and I attach some plans about how this will all proceed.

For the present therefore, I would be grateful if the Chairman of your Board, or legal representative of the Board, could reply to me including the following text:

"This reply is on behalf of the Board of [name of centre]. The Board has read the Jura Consultancy report in relation to the centre and is content that it contains reliable information relating to the existing and expected business performance of the centre. The Board understands that the Scottish Executive, in partnership with Scottish Enterprise, intends to make available adequate grant aid to support the revenue and various urgent capital needs of the centre during 2004-05, as set out in the Jura report, and that firm proposals are in hand to provide similar support in future years. The Board understand the continued need for the centre to work to attract sponsorship from other public and private sponsors, and that ongoing evidence of this effort will need to be provided.

"The Board accepts that all funding provision by the Executive will be dependent on adequate progress being made by the centre on the business improvements identified in the Jura report, including greater collaborative working with the other 3 centres, and other science education providers, sharing of exhibition material and development of the centre's involvement with school education, and other specific improvements mentioned in the Jura report. The Board and Management of the centre will work in full co-operation with the Jura Consultancy, the Scottish Executive and other public funders with the aim of implementing these transitional changes with due speed and within timescales to be agreed through further negotiation. I agree that the Scottish Executive can announce the general terms of these plans in the near future."

As we propose to make an announcement shortly, I would be grateful if you could reply as soon as possible and no later than Thursday 3rd of June. I look forward to hearing from you.

Yours sincerely



ANDY BISHOP

ANNEX A

1. In advance of the Scottish Executive agreeing to provide a level of revenue grant support to assist the Science Centres in Scotland Jura Consultants has been asked to set up a suitable monitoring regime. This will rely on performance and financial information provided by the Science Centres. It is proposed that Jura Consultants will liaise with the four science centres to obtain and agree business plans including monthly cash flows and monthly income and expenditure statements for the next 6 months. Following the provision of this information, the Executive will, if necessary, make an offer of revenue grant to cover this 6 month period.
2. Jura will provide quarterly monitoring reports to the Executive and will arrange a series of monitoring meetings with the Chief Executives at each Science Centre to outline their monitoring role and the requirements. Jura will prepare a drawdown report for submission to the Scottish Executive to accompany the drawdown request with a clear recommendation on whether payment should be made and in what amount payment should be, with a reconciliation and explanation of any variation between the Science Centres' requests and the recommendation.
3. Jura will also review and comment on requests for capital funding should such funding be included in the interim support package, support to the Scottish Enterprise Network in its deliberations on potential capital and revenue support to individual science centres. The ad-hoc support would also include monitoring progress on any capital works instructed by the Science Centres independent of how they were funded.
4. It is proposed that the Chief Executives will meet in June/July with a view to discussing longer term key performance indicators, management accounting systems, sharing of exhibitions, funding applications and any other areas where there is overlap between the centres.

APPENDIX 8

SCOTTISH EXECUTIVE PAPER – MEASURING SUCCESS

DRAFT FOR DISCUSSION

MEASURING THE SUCCESS OF THE NETWORK OF SCIENCE CENTRES

PRINCIPLE THEMES

1. Operating as successful and quality visitor centres
2. Communicating science to society
3. Contributing to the science education of pupils and teachers
4. Collaboration across Science Centres and Science and Society initiatives
5. Sustainable science developments in society
6. Ensuring appropriate accountability and governance

Targets by Centre for 2004/05

Glasgow	Our Dynamic Earth	Satrosphere	Sensation

Achievements by Centre for 2004/05

Glasgow	Our Dynamic Earth	Satrosphere	Sensation

APPENDIX 9

SCOTTISH EXECUTIVE PAPER – INFORMATION FOR NETWORK OF SCIENCE CENTRES

INFORMATION FOR NETWORK OF SCIENCE CENTRES

PRINCIPLE THEME

Operating as successful and quality visitor centres

HIGH LEVEL OUTCOMES

- Develop visible icons of science as a priority in Scotland
- Provide cultural sites, explaining contribution of scientists and innovators to our heritage
- Attract as many visitors/users as possible to the science malls and supporting facilities
- Ensure the provision of high quality of retail outlets relevant to markets
- Ensure the provision of high a quality of café
- Ensure the provision of high quality of meeting venues for high profile events
- Make the centres a recognised presence outside Scotland
- Ensuring that visitors have an enjoyable experience
- Ensure visitors gain value for money

OBJECTIVES

- Awards/official recognition achieved – eg STB and other accreditations
- Projects well maintained (buildings) with good appearance of facilities
- Exhibitory renewal programme in place
- Accessible to all (DDA)
- Provide good operational information:
 - visitor numbers to exhibits/malls
 - transaction numbers at catering/retail facilities
 - mall retail/catering conversion levels
 - footfall to sites
 - corporate income
 - visitor satisfaction levels
 - visitor enjoyment
 - rates of repeat visits
 - other information by undertaking robust and consistent user/visitor surveys
- Provide good information to customers:
 - Develop a gateway website
 - Visible/quality Signage
- Provide good customer service:
 - Part of QA scheme/IIP
 - H & S committed
- Reduce overall seasonality for Scotland

Targets by Centre

Glasgow	Our Dynamic Earth	Satrosphere	Sensation

INFORMATION FOR NETWORK OF SCIENCE CENTRES

PRINCIPLE THEME

Communicating science to society

HIGH LEVEL OUTCOMES

- Increase/Improve level of engagement in science with all citizens of Scotland
- Benefit the individual, economy and society via civic participation
- Ensure the centres are seen to be places where public can be engaged in considering topical science issues

OBJECTIVES

- **Engaging with society**
 - Informed citizens – today's issues for adults
 - Assess the wider impact of science centres (commission research?) focusing on learning, education and impact on science
 - Link to citizenship
- **Target groups:**
 - All ages
 - Rural areas
 - Women
 - Ethnic minority
 - Youth
- **Improving science content**
 - Develop breadth of science provided
 - Use modern technology
 - All centres and other science organisations to communicate
 - Wider collaboration
 - Use travelling exhibits
 - Network science advisory board

Targets by Centre

Glasgow	Our Dynamic Earth	Satrosphere	Sensation

INFORMATION FOR NETWORK OF SCIENCE CENTRES

PRINCIPLE THEME

Contributing to the science education of pupils and teachers

HIGH LEVEL OUTCOMES

Education

1. Pupils

- a. Engage schools in education at science centres
- b. Engage Social Inclusion Partnership Area schools
- c. Meet the Primary curriculum
- d. Attracts primary school aged pupils to centres
- e. Ensure that primary pupils have enjoyed their experience
- f. Meet the Secondary curriculum
- g. Attract secondary school pupils to centres
- h. Ensure that secondary pupils have enjoyed their experience
- i. Ensure that all pupils have been involved in a learning experience
- j. Improve on previous HMI report results

2. Teachers

- a. Provide teachers with satisfaction, support and opportunities at Science centres both as part of school visits and CPD

OBJECTIVES

1. Pupils

- Monitor number of schools involved in visits/outreach
- Monitor number of schools in SIP/CPD area
- Monitor no of school pupils and age/class group
- Assess relevance of products/services to school curriculum
- Monitor satisfaction levels
- Collect qualitative and quantitative feedback on education visits/assessing links with school curriculum
- HMI Report
- All ages to be reached
- Cooperation with other key players
- Virtual/internet access creation/content

2. Teachers

- Satisfaction levels
- Consider needs of teachers
- No. of CPD placements
- Rationalise and improved quality of CPD

Targets by Centre

Glasgow	Our Dynamic Earth	Satrosphere	Sensation

INFORMATION FOR NETWORK OF SCIENCE CENTRES

PRINCIPLE THEME

Collaboration across Science Centres and Science & Society initiatives

HIGH LEVEL OUTCOMES

- Add value and reduce duplication
- Be part of partnership for better public engagement in Science & Technology

OBJECTIVES

- Develop activities and events for delivery with other centres and other organisations
- Allow use of centres/facilities by partners
- Share expertise and partnership working within centres and other organisations
- Develop touring exhibits
- Develop collective/collaborative outreach materials
- Sharing information and inform decision making
- Eliminate duplication
- Development/sharing of shows
- Development of workshops

Targets by Centre

Glasgow	Our Dynamic Earth	Satrosphere	Sensation

INFORMATION FOR NETWORK OF SCIENCE CENTRES

PRINCIPLE THEME

Sustainable science developments in society

HIGH LEVEL OUTCOMES

- To play a role in the long-term aims of local economic regeneration
- To play a role as a Tourist destinations, helping to boost local economies
- To link science with local businesses, universities

OBJECTIVES

- Professional development for science communicators/actors
- Monitor and report on links to ATB's
- Monitor and report on links to business community
- Monitor and report on links to FE sites
- Develop funding partnerships
- Management best practice
- Knowledge sharing
- Keep local views in mind and market individual centres
- Maximise earned income streams
- Network to exploit economies of scale

Targets by Centre

Glasgow	Our Dynamic Earth	Satrosphere	Sensation

INFORMATION FOR NETWORK OF SCIENCE CENTRES

PRINCIPLE THEME

Ensuring appropriate accountability and governance

HIGH LEVEL OUTCOMES

- To ensure clear, transparent and effective governance
- To develop clear business cases for bids for funding for revenue and capital activity
- To develop the role of science centres and science understanding through collaboration with others in Science and Society

OBJECTIVES

- Meeting Nolan principles
- Board understanding and engagement
- Performance Measurement
- Benchmarking
- Use standardised templates for seeking funds
- Develop complementary targets
- Risk management

Targets by Centre

Glasgow	Our Dynamic Earth	Satrosphere	Sensation

APPENDIX 10

SCOTTISH EXECUTIVE PAPER – QUARTERLY PERFORMANCE REPORT / CLAIM FOR PAYMENT

Paul Jennings

From: Michael.Roy@scotland.gsi.gov.uk
Sent: 28 June 2005 14:46
To: Paul Jennings
Subject: Quarterly Performance Report/Claim for Payment (draft)

This email and any files transmitted with it are intended solely for the use of the individual or entity to whom the
are addressed.

Paul – sanity check required. What thinkest thou, in terms of a draft monitoring proforma?

I don't have a copy of the Jura drawdown report, and thus have gone back to the drawing board.

Am I missing anything vital? Should anything be restated?

All the best,

Michael

Dear all,

<<Quarterly report.xls>>

Quarterly Performance Report/Claim for Payment

Please submit, by return, your claim for payment on company headed paper, for the coming Quarter.

This should be prepared in the context of the Department's offer letter, whose conditions determine how your gr will be paid. Your claim should be in the amount specified for the coming Quarter as outlined in your offer letter amendment thereto).

In addition, please provide:

- the attached spreadsheet, completed. These should reflect your actual performance for the previous Quarter, and prepared by the Director of Finance or key individual responsible for the finances of the Trust;
 - a report on your Science Centre covering progress to date in meeting your commercial targets (such as ticketed visitors, and corporate income) and educational (pupil inreach and outreach) objectives, as defined within your Annual Operating Plan, and, in a wider sense, within the Scottish Science Centres Network Strategy;
- This report should also;
- a) detail any change in key Project/Trust personnel (such as Senior Managerial or Director positions);
 - b) provide an assessment of any change in the prospects of meeting commercial targets. The criteria by which any changes are to be measured are against the key assumptions and measures as contained within your Annual Operating Plan;

c) inform us of any substantive issues or occurrences affecting the Centre in the previous Quarter, such as breaches of Health and Safety legislation, serious thefts, or occurrences of a similar serious nature.

- an assessment of all your major capital programmes currently underway, including up to date project costings, expenditure GANTT charts where appropriate, displaying progress toward key milestones, a synopsis of progress made since the previous report, what problems have been encountered and how they have been overcome;
- management accounts covering at least the last quarter;
- audited accounts for the Trust's latest financial year, if available, unless already supplied;

Michael Roy

Project Finance Executive

Science and Society Team - Higher Education and Science Division

Scottish Executive Enterprise, Transport and Lifelong Learning Department

2nd Floor Europa Building,

450 Argyle Street, Glasgow G2 8LG

Tel: 0141 242 0291 (direct line)

Mob: 0777 3420153

Fax: 0141 242 0193

The original of this email was scanned for viruses by the Government Secure Intranet (GSI) virus scanning service supplied exclusively by Energis in partnership with MessageLabs.

On leaving the GSI this email was certified virus-free

	Original 2005/06 target	Q1 Actuals	Quarterly Breakdown Q2 Forecast	Q3 Forecast	Q4 Forecast	Revised 2005/06 Forecast	Variance from target
ticketed visitors	0	0	0	0	0	0	0
pupils (inreach)							0
pupils (outreach)							0
Total	0	0	0	0	0	0	0
Income							
ticketed sales							-
corporate							-
shop and cafe							-
SE Grant							-
(non SE) grant/sponsorship							-
car parking							-
other - please state							-
Total income							-
Expenditure							
Cost of Goods							-
Staff Costs (direct)							-
Staff Costs (indirect)							-
Building Costs							-
Finance and Admin							-
other - please state							-
Total outgoings before renewals							-
Net Operating Surplus/(Deficit)							-
Operating renewals							-
Profit/(Deficit)							-

APPENDIX 11

SCOTTISH GOVERNMENT LETTER – FUTURE FUNDING OF SCOTTISH SCIENCE CENTRES NETWORK

Office of the Chief Scientific Adviser
Professor Anne Glover, Chief Scientific Adviser for Scotland

T: 0131-244 2663
E: anne.glover@scotland.gsi.gov.uk



David Sigsworth
Chair
Dundee Science Centre (Sensation)
Greenmarket
DUNDEE DD1 4QB

21 December 2007

Dear David

FUTURE FUNDING OF SCOTTISH SCIENCE CENTRES NETWORK

I am delighted to confirm that the Scottish Ministers have decided to continue to provide discretionary financial support for science engagement in Scotland, including the four Science Centres comprising the Scottish Science Centres Network.

In the context of Scottish Ministers' desire to see public funding driven by value-for-money and achievement of outcomes, key features of our support for the period 1 April 2008-31 March 2011 are as follows:

- Funding will continue to be offered on a **discretionary basis**; Science Centres are free to accept or decline the offer of funding and its associated conditions;
- Funding will be offered on a **36-month contract** basis, to assist business planning and remove the need for annual negotiations;
- Funding will shift to an **outcome-driven formula based on share of Network visitors** to reflect Scottish Ministers' aims. This shift will be phased over the next two years in a stepped transition, such that by 2010-2011 funding will be offered 100% on the basis of share of Network visitors;
- Up to **£2.43m will be offered across the Network for each of the next three financial years**, according to the following stepped transition towards fully outcome-based funding:

2008-09

50% of available funding distributed according to share of Network revenue support received over last two financial years; remaining 50% of available funding distributed according to share of Network visitor totals on a quarter-by-quarter basis;

2009-10

25% of available funding distributed according to share of Network revenue support received over last two years; remaining 75% of available funding distributed according to share of Network visitor totals on a quarter-by-quarter basis;

2010-11

100% of available funding distributed according to share of Network visitor totals, based on actual visitor figures for the preceding Quarter;

- **Network targets for visitor numbers** will be set, to help ensure that all the Science Centres are working to a common goal in this area;
- Funding will shift to **quarterly payments in arrears**, according to actual performance in the preceding quarter;
- Following a recommendation from HMIE, a further £126,000 will be available annually across the Network as a **transport subsidy** to enable visits to the Science Centres by particular school and community groups;
- Finally, I will expect the network to develop consistent **qualitative and quantitative performance measures**, in discussion with members of my team.

Further details on all the above points will be made available to your Chief Executive in due course.

I appreciate that until now your Science Centre will have been uncertain as to the availability of Scottish Government funding, given that the current funding package is due to end in March 2008. I am sure you will agree that the desire of Scottish Ministers to continue to provide funding is very good news. I believe that this new funding approach will provide both stability (in terms of the longer-term confirmation of levels of grants) and an incentive to the Science Centres to focus on working as a Network to engage with an increasing share of the Scottish population.

During the period 2008-11, Scottish Ministers also wish to see a good balance of commercial and science engagement activity at each Centre. This is to help ensure a high quality science engagement experience for visitors, while at the same time reducing the reliance of the Centres on public funding; the Science Centres are now mature businesses and should increasingly operate as independent commercial entities with diverse income streams.

I would be happy to discuss this funding offer in more detail with you, if you wish, and have asked my PA to arrange a meeting with the Chairs of all the Science Centres in the New Year.

I am writing to the Chairs of all the Science Centres in the same terms.

Yours sincerely



Professor Anne Glover
Chief Scientific Adviser for Scotland

APPENDIX 12

SCOTTISH GOVERNMENT LETTER – SCOTTISH GOVERNMENT OPERATIONAL FUNDING 2008-11: CALL FOR PROPOSALS

Office of the Chief Scientific Adviser
Science and Society Division

T: 0131-244-2113
E: ScienceEngagement@scotland.gsi.gov.uk



The Scottish
Government

Mr Paul Jennings
Chief Executive Officer
Sensation
Greenmarket
Dundee
DD1 4QB

1 February 2008

Dear Paul,

Scottish Government Operational Funding 2008-2011: Call for Proposals

I am pleased to enclose further details of the continuing funding package Scottish Ministers are offering to the Scottish Science Centre Network (SSCN).

This develops the strategic principles set out in the letter of 21 December 2007 from the Chief Scientific Adviser, Professor Anne Glover, to the Science Centre Chairs. These principles were further discussed at a meeting between Professor Glover and the Science Centre Chairs in St Andrew's House on 29 January 2008.

As you will see, a formal offer of funding is conditional upon a number of activities and proposals from individual Centres and collectively from SSCN.

As advised in my e-mail of 10 January 2008, I would be happy to meet with you if necessary to clarify any questions you may have. Otherwise, I look forward to receiving your proposals in due course.

Yours sincerely

Dr Isabel Bruce
Director
Science and Society Division, OCSA



Scottish Government - Office of the Chief Scientific Adviser – Science and Society Division

Science Engagement in Scotland's Science Centres

Call to the Scottish Science Centres Network for proposals for 2008-2011

Summary of New Funding Package

The Scottish Government (SG) hereby confirms that Scottish Ministers have approved a continuing discretionary funding package for science engagement in Scotland which includes SG support for the four Science Centres comprising the Scottish Science Centres Network (SSCN). This funding is set within the context of SG's 'Smarter Scotland' strategic objective.

Key features of the new funding package are as follows.

- A total of up to £7.68m will be available to the SSCN between 2008 and 2011. Up to £2.56m will be available annually during each of the coming 3 financial years to the end of the 2007 Spending Review period (2008-09, 2009-10 and 2010-11).
- Funding will be offered on a 36-month contractual basis. This will provide a level of financial stability to the Centres and (subject to satisfactory performance) avoid the need to renegotiate funding each year.
- Funding to individual Centres will be paid quarterly in-arrears and will reflect numbers of Network paying visitors. Levels of funding in each quarter will therefore fluctuate seasonally and with each Centre's share of Network paying visitors in each quarter.
- Each Centre operates as an independent commercial business. Centres should view this funding stream as one component of their income, and as an opportunity for continued business improvement and growth in science engagement.

In return for this funding, SSCN is expected to offer science engagement experiences that:

- attract the following total Network paying visitors each year – the Network being defined for the purposes of this document as The Science Mall at Glasgow Science Centre (and including the Planetarium), Our Dynamic Earth, Satrosphere and Sensation:

	2008-09	2009-10	2010-11
Network paying visitors	600,000	625,000	650,000

- provide an inspiring, accessible and high quality focus for informal science education and engagement for Scots of all ages in our four largest cities;
- complement the formal education science curriculum and promote science careers to young people, helping to ensure a future supply of scientists;
- provide opportunities for Scottish Higher Education Institutes, Research Institutes, industry and businesses to showcase new scientific research, products and processes, highlighting the excellence of Scottish science and innovation, and the relevance and importance of science to the Scottish economy.

Background

Several complementary influences underpin the principles behind the new funding package:

- the focus of Scottish Ministers on achievement of outputs, outcomes and value for money for all public investment;
- a desire by SG to see a more consistent quality of delivery across the Network;
- the SSCN Strategy 2005-09 states that by 2007-8, the “*level of support for Centres [should be] more strongly linked to outputs*”;
- the independent review of government funding of SSCN since 2004 commissioned from Halcrow consultants recommended an output and outcome-based approach to funding, linked to performance objectives and each Centre’s share of Network paying visitors;
- the 2007 HMIE review of the educational quality of the Centres’ facilities and services recommended that SG should:
 - “*provide a commitment to funding Centres over a more extended period so that they can operate in a more financially-secure environment, engage in longer-term budget planning and take account of the need to secure improved continuity of staffing in education teams*”;
 - “*provide further subsidies to cover the cost of school visits and transport to the Science Centres, including additional funding to target pupils from socially, economically or geographically disadvantaged areas.*”

Measuring performance

The ultimate strategic outcome driving SG funding of SSCN is achievement of a ‘Smarter Scotland’. The new funding package is in acknowledgement of the important part that SSCN plays in helping to achieve this. In return for this funding, SG is setting out the things it expects the Centres to individually and/or collectively achieve as their contribution to achieving a ‘Smarter Scotland’. These are defined by way of a number of supporting strategic short-term outputs and long-term outcomes. Progress in achieving these will be measured through a SMART¹ reporting framework incorporating key performance indicators (KPIs), performance measures and time-related targets. An outline of each of these outputs and outcomes is set out below.

Short-term outputs

- (a) Network paying visitors. To provide an inspiring and accessible focus for informal science education and engagement for Scots of all ages in our four largest cities, SG has set rising year-on-year Network paying visitor targets which the Centres must collaborate to meet in return for funding. This will require the Centres to attract more Network paying visitors year-on-year from across Scotland from all backgrounds and ages. Over the coming 3 years, an increasing proportion of Network paying visitors shall originate from geographically remote and/or socially and/or economically disadvantaged areas of Scotland.

The term ‘paying visitor’ requires a detailed definition to be agreed across SSCN in liaison with OCSA, but shall be taken to include paying visits to the Centre by (1) educational/school/college groups, (2) the general public, (3) family and community groups, and exclude website visits, commercial and corporate visitors, staff and contractors.

KPIs are to include:

- number of paying visitors to the Centre and the Network;
- number of paying visitors by socio-economic group, age, provenance and nature of groups (e.g. friends, family, extended family), based on visitor profile information collected by periodic surveys.

¹ SMART performance measures are Specific, Measurable, Achievable, Relevant and Time-based.

- (b) Visitor satisfaction. To ensure quality of experience, a common system is required to enable recording and analysis of visitor satisfaction, under which each Centre should aim to achieve an average rating of no less than 8 out of 10 for all visits.

KPIs are to include:

- satisfaction rating by paying visitors for the overall Centre visit experience;
- satisfaction rating by paying visitors for the individual components of the Centre visit, including: visitor reception and ticketing; café; retail; toilets; permanent exhibitions; temporary exhibitions; parking and access.

A consistent methodology is to be developed and applied across SSCN to achieve meaningful comparisons over time and across Centres.

- (c) VisitScotland rating. To ensure overall quality of facilities and buildings, each Centre should achieve and maintain at least a four star rating from VisitScotland.
- (d) Sound science. SG is aware that each Centre's offering is unique, and seeks assurance that the engagement experiences are scientifically sound. This requires that consistent processes are in place in each Centre to ensure the delivery of scientifically robust experiences. A quality standard tool is required to be developed by 2009 and applied across SSCN to drive year-on-year enhancements in science engagement delivery processes.

KPIs are to include:

- quality standards to consider processes, intermediate outputs and final outputs.²
- (e) HMIE inspection recommendations. To ensure educational quality, each Centre should ensure that project proposals recently approved for funding by the Office of the Chief Scientific Adviser (OCSA) in relation to recommendations arising from the 2007 HMIE inspection are implemented by 2009.³

KPIs are to include:

- measure(s) of the extent to which implementation of proposals and projects tracks through to achievement of other outputs and outcomes.
- (f) Links to Curriculum for Excellence. To ensure contribution to a *Curriculum for Excellence*, each Centre should consider the part it will play in complementing the formal science curriculum and promoting science careers to young people is required.
- (g) Showcasing contemporary science. To ensure the accessibility to Network paying visitors of contemporary science, and to promote cutting edge science as the 'engine of the economy' and a vital component of a vibrant culture, each Centre should provide a range of opportunities augmenting the 'static nature' of its normal offering. Such opportunities should be made available to Scottish Higher Education Institutes, Research Institutes, industry and businesses to showcase new scientific research, products and processes, highlighting the excellence of Scottish science and innovation.

Long-term outcomes

- (h) Awareness of Science Centres. To demonstrate increasing awareness among the wider Scottish public of the existence of, and experiences offered by, the SSCN. Methods are required to measure and record long-term: trends in family-group and public visits; trends in school and

² Process measures are likely to be more reliable in the short term until intermediate and final measures become observable and measurable.

³ Other areas of activity (for example teacher CPD) are outwith OCSA's funding remit and are the responsibility of each Centre and/or the Network to develop as part of normal business operation and partnership development.

college visits of 3-18 year olds; trends in visitors from geographically remote and/or socially and/or economically disadvantaged areas of Scotland.

- (i) Science culture. To demonstrate SSCN's contribution to achieving an improving science culture at a societal level across the wider Scottish public. Methods are required to measure and record long-term trends in awareness, understanding and perception of relevance to everyday life of Science, Technology, Engineering and Mathematics (STEM) subjects and issues. Trends in Network paying visitors do not on their own demonstrate an improving science culture - a deeper analysis is required.

KPIs may include:

- measures of changes in behaviour (e.g. omnibus surveys investigating '*Have you visited a science centre in the last 6 months?*');
 - measures of changes in attitude (e.g. omnibus surveys investigating '*Would you consider visiting a science centre in the next 6 months?*');
 - number of repeat visits to the Centre;
 - measures of changes in attitude (e.g. omnibus surveys investigating '*Would you consider a career in science?*');
- (j) Uptake of science education and careers. To demonstrate SSCN's contribution to helping to ensure a future supply of scientists in Scotland, methods are required to measure and record in the long-term: trends in the number of primary school pupils opting to continue STEM subjects into secondary school or further education; trends of number of secondary school pupils opting to continue STEM subjects into higher education; trends in number of STEM graduates continuing with a career in STEM subjects.

New Funding Package 2008 - 2011

To support SSCN in achieving the outputs and outcomes outlined above, SG is making available £2.56m annually across the Network during each of the coming 3 financial years (2008-09, 2009-10 and 2010-11). This comprises 2 elements.

- £2.43m per year for continued discretionary operational support across the Network, divided according to each Centre's percentage share of total Network paying visitors in each Quarter. Regardless of the absolute number of Network paying visitors in any one year, the total funding available annually is capped at this level. Should the Network exceed the paying visitor targets, no additional funding will be available. Instead, this will be seen as a positive result, enabled in part by SG funding alongside the good efforts of the Centres, and each Centre will receive the additional ticket income.
- £126,000 per year for a transport subsidy to increase Network paying visitors from geographically remote and/or socially and/or economically disadvantaged areas, from where transport costs may be a real disincentive to visiting a Science Centre. This element of the funding package builds on the pilot of the last two years whereby a group books a visit to a Science Centre and transport is subsidised by SG funding. This funding will run from 1 July 2008.

Related features of the new funding package are as follows.

- SG is aware that the new package will involve some significant redistribution of funding across the Network. The new funding arrangements will therefore be phased in over a two-year transition period.
- To provide financial stability and to avoid annual negotiations, funding will be offered on a 36-month contractual basis.

- A shift in payment mechanism, from the current in-advance arrangement to a new in-arrears basis linked to actual Network paying visitors, will also be phased in over a shorter transition period – commencing Quarter 3 2008. This is to ensure compliance with public funding requirements.

The tables below set out indicative funding to each Centre for the period 1 August 2008 to 31 March 2011 under the new package, reflecting the new basis for funding and transitional phases described above. The figures are based on historic Network paying visitor returns and will clearly shift to actual returns once the new arrangements are in place.

Indicative Funding to Centres

Year 1 – 2008-09

Centre	50% funding allocated by 2006-07 & 2007-08 <u>financial</u> share	50% allocated by 2006-07 <u>visitor</u> share (indicative only ⁴)	Total 'basic' funding	Transport Subsidy
Glasgow Science Centre	£874,800 (72.0%)	£540,675 (44.5%)	£1.415m	tba by SSCN
Our Dynamic Earth	£188,325 (15.5%)	£455,625 (37.5%)	£0.644m	tba by SSCN
Satrosphere, Aberdeen	£78,975 (6.5%)	£91,125 (7.5%)	£0.170m	tba by SSCN
Sensation, Dundee	£72,900 (6.0%)	£127,575 (10.5%)	£0.200m	tba by SSCN
Total of £2.56m	£1,215,000	£1,215,000	£2.43m	£0.126m
Network paying visitors	600,000			

Year 2 – 2009-10

Centre	25% funding allocated by 2006-07 & 2007-08 <u>financial</u> share	75% allocated by 2006-07 <u>visitor</u> share (indicative only ⁵)	Total 'basic' funding	Transport Subsidy
Glasgow Science Centre	£437,400 (72.0%)	£811,012 (44.5%)	£1.248m	tba by SSCN
Our Dynamic Earth	£94,162 (15.5%)	£683,437 (37.5%)	£0.778m	tba by SSCN
Satrosphere, Aberdeen	£39,487 (6.5%)	£136,687 (7.5%)	£0.176m	tba by SSCN
Sensation, Dundee	£36,450 (6.0%)	£191,362 (10.5%)	£0.228m	tba by SSCN
Total of £2.56m	£607,499	£1,822,498	£2.43m	£0.126m
Network paying visitors	625,000			

Year 3 – 2010-11

Centre	100% allocated by 2006-07 <u>visitor</u> share (indicative only ⁶)	Transport Subsidy
Glasgow Science Centre	£1.08m (44.5%)	tba by SSCN
Our Dynamic Earth, Edinburgh	£0.91m (37.5%)	tba by SSCN
Satrosphere, Aberdeen	£0.18m (7.5%)	tba by SSCN
Sensation, Dundee	£0.26m (10.5%)	tba by SSCN
Total of £2.56m	£2.43m	£0.126m
Network paying visitors	650,000	

⁴ Up-to-date figures would be used to determine actual funding.

⁵ Up-to-date figures would be used to determine actual funding.

⁶ Up-to-date figures would be used to determine actual funding.

Call for proposals

Contracts will be awarded under the new funding package subject to the following conditions.

1. In close partnership with OCSA and any other SG-nominated parties, SSCN is invited to commence detailed collective development of the common performance measurement framework set out above. This work shall include agreeing a final definition for 'paying visitors' (required by 31 March 2008) and development of KPIs, performance measures, targets and associated monitoring and reporting mechanisms. SG expects the four Centres to work together to provide a unified proposal to OCSA for implementation by 30 September 2008 to underpin the introduction of the in-arrears payment arrangements. OCSA recognises that these matters will involve significant discussion and requests an interim progress summary to be submitted by 16 June 2008.
2. Each Centre shall submit to OCSA by 31 March 2008 a one-year detailed science engagement proposal for the 2008-9 financial year setting out its plans for short-term delivery and contribution to achieving the strategic outputs and outcomes. The proposal shall draw on the work underway at (1) above as far as possible by incorporating any individual and collective actions the Centre can commit to at this stage.
3. Each Centre shall submit to OCSA by 30 September 2008 a three-year strategic proposal which absorbs the one-year proposal above and sets out its plans for long-term delivery and contribution to achieving the strategic outputs and outcomes through to 2011.
4. Each Centre shall submit to OCSA by 31 March 2009 and 31 March 2010 a detailed annual proposal for the 2009-10 and 2010-11 financial years respectively which reflects the above three-year strategic proposal.
5. SSCN shall submit to OCSA by 31 March 2008 an agreed proposal for distribution of the annual £126,000 transport subsidy, based on its experience from the previous pilot.

Conclusion

The new landscape for SG funding of informal science education and engagement across Scotland is one where the focus of increased in-reach to the Science Centres is complemented by an increase in out-reach initiatives from a range of providers throughout Scotland.

SG believes that the new funding package for Science Centre in-reach described above:

- is transparent, easily understood, and delivers value for money whilst also stimulating increased Network paying visitors;
- will ensure that more of the population benefits from the Science Centre resource in Scotland;
- will widen access to the Centres by making available additional funds to help subsidise transport costs of visiting a Science Centre for schools and community groups from geographically remote and/or socially and/or economically disadvantaged areas;
- will ensure that the Science Centres make a greater contribution to SG's 'Smarter Scotland' strategic objective by complementing the formal education curriculum, showcasing the best Scottish science and innovation, promoting science careers, and helping to increase 'science literacy' and a 'science culture' in the wider Scottish population; additional separate funding from SG to ensure the continued involvement and advice from HMIE will help the Centres ensure the educational quality of their activity.

In addition to the new funding package for Science Centres in-reach described above, SG also operates a Science Engagement Grants scheme for out-reach projects and activities to schools and community groups across Scotland (science festivals, mobile science laboratories, roadshows etc.). The Science Centres are eligible to bid for this funding for out-reach and bids will be assessed according to the criteria applied to other bidders.

Science and Society Division, OCSA

1 February 2008

APPENDIX 13

MINUTES OF THE SSCN MEETING OF 26TH FEBRUARY 2008

**PROFESSIONAL DOCTORATE RELATED MEETING OF THE
SSCN CEO's AND SCIENTIFIC DIRECTORS
TO BE HELD AT
OUR DYNAMIC EARTH, EDINBURGH
TUESDAY 26th FEBRUARY 2008 AT 12:00**

AGENDA

- | | |
|---|------------|
| 1. Doctorate update | P Jennings |
| 2. An emerging model | P Jennings |
| 3. Scottish Executive, call for proposals | All |
| 4. Advancing a common methodology | All |
| 5. Transport subsidy | All |
| 6. AOB | |
| Date and time of next meeting | |

Distribution:

Dr. Robin Hoyle, Scientific Director, Glasgow Science Centre
Dr. Stuart Monro, Scientific Director, Our Dynamic Earth
Kirk Ramsay, Chief Executive, Glasgow Science Centre
John Simpson, Chief Executive, Our Dynamic Earth

Also in attendance:

Paul Jennings, Chief Executive, Dundee Science Centre (also representing
Satrosphere Science Centre)
Catherine Merrick, PA/Finance Administrator, Our Dynamic Earth

**PROFESSIONAL DOCTORATE RELATED MEETING OF
THE SSCN CEO'S AND SCIENTIFIC DIRECTORS**
MINUTES OF THE MEETING HELD AT OUR DYNAMIC EARTH ON
26 FEBRUARY 2008 AT 12:00PM

PRESENT

- Paul Jennings (PJ)
- Kirk Ramsay (KR)
- Robin Hoyle (RH)
- John Simpson (JS)
- Stuart Monro (SM)

Paul Jennings (PJ) thanked all for attending. PJ referred to the agenda but suggested that 4 main areas are considered in the meeting:

- 1) To agree feed back to the Scottish Government and by when
- 2) To identify KPIs
- 3) To establish the definition of a 'paying visitor'.
- 4) To discuss the transport subsidy and favoured allocation amongst the Centres.

ITEM

DESCRIPTION

1

DOCTORATE UPDATE

- PJ advised that he has conducted circa 50 interviews across an international audience of mainly Science Centre CEOs. This consisted of 30 people in the first round and was reduced to 20 people in the second due to breadth and quality of interviews.
- Results so far highlighted no new sophisticated models and the better and larger frameworks all carried a large amount of paperwork which we would want to avoid. PJ also noted that it would be pointless to come up with a model that is not suitable to the Government. Any proposed model should agree with the Scottish Government but should not be set by them.
- PJ presented 2 papers to the meeting. The first ('Early Observations & KPI's that have emerged out of interviews') lists key opinions discussed in the interviews. PJ suggested they go through this list point by point to see what elements were relevant to us as a network. These have been numbered for ease of reference:
 - 1) PJ clarified that a one size fits all approach may not be appropriate for SSCN as each centre differs in various ways (e.g. size). Discussion followed and JS confirmed that there will be certain areas that will be comparable across the Centres but there will be more differences than commonalities. SM suggested that each Centre has developed its own character and particular area of expertise and therefore cannot be compared. KR advised that it is important to understand what the comparators are and realise that they do not necessarily lie in Scotland – we look internationally and that's how we develop world class performance. He maintained that it is healthy to recognise that we are four different Centres as this is a strength. RH agreed by advising that we should be looking outward and not inward for comparators.
 - 2) PJ expanded on this point by saying the performance framework does not have to be all about the Network or all about the individual Centres, it can strike a balance between the two. It is up to us to define what a network is and what it needs to achieve – there may be times when it is appropriate to come together as a network. SM advised that there are a number of different networks, local and international and it would be a mistake just to focus on SSCN. KR commented that by definition

**PROFESSIONAL DOCTORATE RELATED MEETING OF
THE SSCN CEO'S AND SCIENTIFIC DIRECTORS
MINUTES OF THE MEETING HELD AT OUR DYNAMIC EARTH ON
26 FEBRUARY 2008 AT 12:00PM**

networks are aggregates of individuals that come together because of a shared vision/goals. KR feels we have failed in that so far we have not got together to create this vision. If we did, this could be promoted to the Government. He feels strongly that if we do not address this, the rest of what we are doing does not amount to much. JS highlighted that the role of the Government should be monitored as they are leveraging quite a degree of control over us which may be inappropriate to the level of the funding they are providing. KR agreed, but suggested that the Government do not want control, they want to leverage benefits or results that show we are meeting their policy aims.

A discussion followed and it was highlighted that we only have a relationship with one department within the Government whereas we should aim to have a dialogue with a range of departments. PJ advised that more involvement with other Government departments was viewed as beneficial and how this could influence government policies. This had come out strongly in the responses received as part of his research. RH voiced his concern that in the report from HMIe, there was a desire that each centre had 'everything for everybody' – he is in favour of a network approach / KPI's, because as a Network, we have 'everything for everybody' and each Centre can look to deliver what it is strong at.

- 3) PJ advised that there was a general notion of keeping the framework simple with a range of between 5 to 10 KPI's. The general principles were agreed by all, although it was highlighted that the problem is how to evaluate impact.

Impact can be generational, and is unlikely to be instantaneous. The timescales to see change are long term - we are trying to create a more scientific literate society which will take many years. It was suggested that we work as a network to deliver impact, not actually having to measure it. It was highlighted that Libraries and Museums will also need to be impact orientated and they could have good indicators or measures that we evaluate – anecdotal indicators may also be important.

- 4) A balanced-scorecard approach emerged as favourable when looking at visitor numbers and quality. This was discussed and KR emphasised that this approach can be useful but requires a maturity of thinking across an organisation and a genuine sharing of knowledge. It was suggested that relative weighting of indicators may be an issue and PJ advised that if this approach is used, it does not mean that all KPI's will be about economy.

A discussion followed regarding the option of basing funding on visitor numbers. It was suggested that basing funding on visitor numbers is bound to create competition amongst the Centres. KR felt strongly that this will definitely create wedges between us and that no business could operate effectively if driven by this. SM suggested that a way of reducing this competition would be if each centre had something unique to offer – JS confirmed that by having individuality and focusing on complementarity, we could reduce the impact of competing for the same market.

**PROFESSIONAL DOCTORATE RELATED MEETING OF
THE SSCN CEO'S AND SCIENTIFIC DIRECTORS
MINUTES OF THE MEETING HELD AT OUR DYNAMIC EARTH ON
26 FEBRUARY 2008 AT 12:00PM**

RH commented that if you look at the demographics of our visitors, we have mainly white middle class visitors and schools. We are currently striving to get the harder to reach audiences interested in Science but should funding be based on visitor numbers alone, we will ignore these more difficult audiences (outreach and community work) and instead focus on the 'easy wins' – this will be detrimental in the long term for the public engagement of science. KR mentioned that he had spoken to Isabel Bruce regarding having an events based model rather than a process based model and she confirmed that they would be prepared to consider proposals that moved slightly from her proposal of a funding model.

JS was not aware of any redesign of what had been tabled, however highlighted the importance of knowing what the situation is going to be, so there can be a degree of business certainty over the next 3 years. His view is that all frameworks will have strengths and weaknesses. RH reiterated the importance of 'selling' our vision/ideas to the politicians as they may be in office for only a short period and will therefore want to see quick results and early success.

- 9) Looking ahead to point 9, PJ questioned the balance between our aspirations and the needs of the Government. SM felt this goes back to the point of the Government being a number of entities and we should try and diversify our approach so that we are not reliant on one income stream from one department. JS stated that he could identify with point 9, although it may not be OCSA that we are 'buying into' but different departments.

PJ highlighted that a clear action point emerging from this is that we should not be constrained by dealing with only one department – it is important that we get their support but, as a Network we should collectively approach different departments and look to promote what it is we can offer them. RH noted that although our focus is on a relationship with the Government, the Network should be working together to tap into Industry in general – with a clear and shared vision, we could tap into a range of different sectors and areas.

Points 5,6,7 and 8 were not discussed at length although partly covered in discussions above. On point 7, KR noted that the number of levels of indicator would depend on what group you are working with and the objective within that group i.e. you could not have one indicator for 'Education' as a whole.

- 10) This point came across strongly in the research – better reports/reviews were done by the experts (often peer groups) in those fields. Agreed by all.

2

AN EMERGING MODEL

- PJ talked about the model which emerged in the venn diagram. PJ looked at the areas of importance that came out of the interviews and those that came out of the Government report and one can see there is some comparability. Methods of measurement regarding customer satisfaction was discussed – this is of common importance between us and the Government. JS confirmed that ODE have different collection methods which are collated monthly and circulated internally. KR confirmed that Glasgow do quarterly reports. PJ advised that the Stratosphere do not do anything and Dundee have a basic questionnaire.

**PROFESSIONAL DOCTORATE RELATED MEETING OF
THE SSCN CEO'S AND SCIENTIFIC DIRECTORS
MINUTES OF THE MEETING HELD AT OUR DYNAMIC EARTH ON
26 FEBRUARY 2008 AT 12:00PM**

- SM advised that there are two aspects to this feedback (1) the leisure market and (2) how stimulating they found the visit in terms of the added value of science awareness.
- RH suggested that we need to establish a quality framework so we can draw on each others experiences to benefit both individually and across the network. The purpose of this should be to improve the business rather than just tick boxes.

3 SCOTTISH GOVERNMENT, CALL FOR PROPOSALS

- KR is concerned with the definition and calculation of 'visitor numbers'. His view was that the OCSA call for proposals meant that Glasgow and ODE's overseas visitors/tourists should not be counted - a Smarter Scotland should be concerned with Scots visitors only. PJ commented that this was not expressly stated, and was unlikely to be the Government's intention.
- PJ stated that the problem lies with distinguishing between someone who is considered a 'tourist' and someone who is not i.e. an Englishman who lives in Scotland. It was suggested that if you have a postcode in Scotland, you could then be counted as Scottish. There would be significant operational difficulties in identifying only Scottish visitor attendance – Post code analysis, it is not always given and may not always be robust.
- Funding allocations as announced in recent Govt press releases would result in a loss of 80-100,000 visitors at GSC. The network would not be able to recover such a visitor loss and therefore the current proposal did not make sense. Both the Tower and IMAX offered positive science engagement experiences and should therefore have visitor numbers included in funding allocation model.
- KR stated that GSC's outreach programme offered in some cases greater value in terms of science engagement than some inreach visits. Accordingly, it would be wrong to exclude these from the visitor definition to be used for apportioning funding.
- JS viewed a visitor as someone who received a ticket for the purposes of visiting the DE exhibition or attending the Education service. The case for including outreach visitors was one for the Govt. to decide. It would be impractical to exclude visitors on the grounds of nationality and would not be supported at either a public or political level.
- RH feels this highlights the flaw of putting such an influence on visitor numbers and believes the Government should be more interested in the quality of what we are providing rather than the numbers we are getting in.
- PJ confirmed that we are in agreement that visitor numbers should not include contractors or corporate customers attending meetings – although it was suggested that these people could still experience, to a lesser degree, some element of Science engagement.
- Agreed that, this definition needs further discussion when there is more time. JS is unsure whether we will be able to come up with a definition that everyone can agree on as we all have a different view of who and what our visitors are – Glasgow have a high outreach focus which they value and ODE considers all guests despite their origins as their key market.
- KR feels this again illustrates the weakness of the model proposed by Scottish Govt, as we would be basing a business model on something we have no control over, - visitor numbers. What would happen to us when the summer weather was good and visitor numbers fell. The Government is assuming that we are more interested in taking peoples money than in developing our business.

**PROFESSIONAL DOCTORATE RELATED MEETING OF
THE SSCN CEO'S AND SCIENTIFIC DIRECTORS
MINUTES OF THE MEETING HELD AT OUR DYNAMIC EARTH ON
26 FEBRUARY 2008 AT 12:00PM**

- PJ then invited views and thoughts on the allocation / split of the Transport subsidy.
- JS supports the status quo whereby there is an equal split of the subsidy given to each of the 4 Centres. All Centres have a National reach and have sufficient access to numbers of 'disadvantaged groups' to warrant an equal 4-way split.
- PJ agreed with this position – much of the current award had already been snapped up by groups and schools in the area highlighting the ongoing need for support in Dundee.
- KR was strongly against such an allocation on the grounds of proportionality. Greatest need as evidenced by the free school meal index and other indices should form the basis of the award and this would highlight a greater need in the west of Scotland. An equal 4 way split was not acceptable to GSC and would therefore not be accepted by him.
- Following a discussion on where compromise should be forthcoming, no agreement could be reached on allocating grant amounts and therefore it was agreed that this would need to be referred back to OCSA for resolution.

4

ADVANCING A COMMON METHODOLOGY

- PJ suggested meeting again before the end of March and in the meantime, each Centre develops a definition of who and what a visitor is. We can each give some thought to the headline measures that have emerged. PJ advised that he will work on the other KPI's in order that these KPI's can be discussed at the next meeting. Agreement needs to be reached over the definition of a visitor by 31st March. This was agreed by all.
- The question arose about whether the Govt. approach could be considered a balanced-scorecard model. OCSA are wanting reports on a number of KPI's and visitors do not appear to be the sole basis for funding. KR did ask the question of OCSA about what would happen if we met the visitor number targets but not the other KPI's - he was not given an answer.
- There is a real challenge in reaching a consensus because of the funding which is at stake. RH suggested that this issue will be made easier if we disregard the visitor number model. Instead we should approach this collectively and decide what we are trying to do for Scottish Society and start by developing quality based KPI's. JS noted this point but stated that we will ultimately end up with disagreement as we are all endeavouring to secure as big a part of the funding pot as possible. It requires the Scottish Government as 'the Customer' to decide how it wants to pay for public engagement of science and who it wants to buy from. We should individually contact OCSA to confirm that as we are unable to reach consensus on key definitions, that OCSA should establish various definitions for us to work with. All agreed to this way forward.
- Once the issue of funding allocation is resolved, all agreed that it should be possible for a reporting framework and KPI's to be established which is acceptable to all. Such a model could then be presented to OCSA.

DATE AND TIME OF NEXT MEETING

Deadlines have to be met by 31 March 2008 so it was suggested that a meeting be held the week commencing the 17th of March. Date of the 20th of March 2008 was agreed. Meeting to be held at the Glasgow Science Centre

**PROFESSIONAL DOCTORATE RELATED MEETING OF
THE SSCN CEO'S AND SCIENTIFIC DIRECTORS
MINUTES OF THE MEETING HELD AT OUR DYNAMIC EARTH ON
26 FEBRUARY 2008 AT 12:00PM**

and to commence at 11:00am.

APPENDIX 14

EARLY OBSERVATIONS AND KPIS WHICH HAD EMERGED FROM THE INTERVIEWS

Early observations and Key Performance Indicators that have emerged out of interviews

General

My interviews highlighted a wide range of opinions over what a performance framework for science centres should look like. The following list captures several of the main themes:

- A common framework needn't mean comparing centres with each other;
- A performance framework which strikes a balance between network and individual KPIs favoured;
- Any framework should be simple, visitor focussed, SMART, impact orientated, value / quality driven, learning based, statistical based;
- Visitor numbers as an emphasis not a problem for most as long as things like quality, investment in needy communities, content, dwell-time not compromised. In this regard it is maybe unsurprising that several favoured a balanced-scorecard approach;
- Some recognised that a focus on numbers could introduce competition into the network. Some saw this as a positive, most who highlighted it saw it as a negative;
- Comparability typically referred to in terms of education related activities;
- Some differences of opinion over whether or not there should be more than one level of indicator. It was usefully suggested that any more than one level should only 'drill-down' as low as is meaningful;
- General view that the total number of KPIs should be kept to manageable levels (ranges between 5 and 10 most cited);
- Any framework should be driven by the needs / wants of the customer (the Scottish Government);
- Strong support for peer review.

A broad number of possible KPIs emerged and while several below might be better currently described as Key Performance Measurements they could serve as a useful starting point. Each has been grouped by the broad areas of interest identified by interviewees.

Social / Community

- Visitor numbers / attendance;
- Widening access (with segmentation);
- Customer satisfaction (typically includes things like VFM, dwell time, etc);
- Quality;
- Market share.

Intellectual / Education

- Delivery against mission;
- Impact related;
- Audience development;
- Careers promotion;
- Range of partnerships;
- Responsiveness to handling contemporary scientific issues;

Finance

- Efficiency measures (most interviewees cited a range of ratios e.g. cost / visitor, earned income / visitor, attendance price / length of visit, etc);
- Success in generating 'other' (non SG) funding;
- Wider economic impact of science centre on their local / regional community;
- Delivery of agreed budget;

APPENDIX 15

MINUTES OF THE SSCN MEETING OF 20TH MARCH 2008

Minutes of meeting on Thursday 20 March 2008
in Glasgow Science Centre Boardroom

Present: Paul Jennings (PJ) – Sensation and Satrosphere
John Simpson (JS) – Our Dynamic Earth
Stuart Monro (SM) – Our Dynamic Earth
Kirk Ramsay (KR) – Glasgow Science Centre
Robin Hoyle (RH) – Glasgow Science Centre
Margaretta Richards (Minutes) – Glasgow Science Centre

PJ opened the meeting by circulating a paper, Transactional Performance Framework between the Scottish Government (SG) and Scottish Science Centres Network (SSCN). The purpose of this meeting was to move on from the last meeting a few weeks ago and how to set kpi's against strategic objectives. PJ advised there are 4 or 5 areas that the SG was pointing towards. Try to assign kpi's, some from interviews, some from the SG letter and in addition look at the relationship of DCMS which is used in museums.

PJ advised that the paper contains 19 indicators, more than suggested, but not unmanageable. Mechanisms are already in place with regard to visitor numbers. It was hoped that following discussion today, agreement would be reached regarding the 19 kpi's, although methodology, etc may take longer.

JS advised that this should not be over complicated and have too many and it may be better to drop these back in number. Obtaining methodology may make the task harder. Possibly we can move forward to take existing kpi's and drop some where necessary. Some quantitative measures may be straightforward. No. 4 indicator from DCMS but seems to have in terms of access and equality. Discussion how figures are collected and presented. PJ suggested areas like No. 4 used against financial year is a test year then after first year will either provide numbers for benchmarking in subsequent years or indicate a review is required at this point.

Some other kpi's may have to be measured by others, eg a peer review panel from organisations such as Ecsite or ASTC, to assess impact and anecdotal evidence to establish benchmarking.

SM – a number that are closely related to try to trim down and import to discriminate between aspects that are quantitave and whether these are best practice elsewhere. Proxy in terms to quantify data which would give proxy indication of 'audience'.

DCMS approach – core kpi's (about 6), methodology applied elsewhere or may not be applicable. SG interested in numbers but also interested in acknowledgement of how we

JS – problem with process is that kpi's measure and targets 2 separate things, but on looking in more detail there are problems. No. 4 is a measurement of different classes of visitors according to location. If this year is used as an initial test, then should be used for increasing numbers.

RH asked how they would want to measure for 2 reasons: 1) do you chance the business to achieve the targets and 2) reporting back if acceptable. Blending set of strategic objectives and kpi's.

PJ – mission/vision statements – DCMS objectives not that much different to sponsored museum objectives. PJ wants to try to keep focus on transactional approach. DCMS is established relationship over many years. Starting point is that SG offers funding.

JS – purpose is to keep SG happy, need to be careful SSCN does not re-work whole business model against the funding provided by SG.

PJ – SG asking us to do this, PJ wants to widen audience.

SM – this should not be at the expense of the existing audience who should not be displaced. About making sure more accessible to a wider range of audience and continue to cater for existing audience + more.

PJ – how do we become more relevant to more people.

RH – this is not reflected on funding offer that has been made. More resource has to be input to attract wider audience.

KR highlighted that no allowance in proposal has been made, we all operate in different environs. Glasgow has 5 times more local population, impact on how much income we can generate through attracting social groups, outreach, compared to inreach. Different structure required to deal with different groups and we can only create a Smarter Scotland by attracting those groups but this is a long term gain. In these areas, this can only be done by a combination of different activities. Not acceptable to attract social groups, need to create more economical and social activity. The model proposed does not recognise different markets in different science centres. Significant issues relating to social groups and classes of the marked. Model is contradictory and model/mechanism does not add up.

RH – SSCN strategy document – we should all be aspiring to make science accessible to all and SG should make sure this happens.

PJ – transactional approach – SG have advised this is what SG want.

RH/KR – SG are wrong in this approach.

JS – GSC have to decide if they want to be part of it. SG do not want to fund CPD, outreach but want to fund the business model. Should be delivering a balanced science centre package.

JS – should there be more dialogue with more government departments to get complete business model. OCSA want acknowledgement and prepared to put current funding into SSCN.

SM – can do something about engagement with groups C2,D,E. Things can be done within ODE to better engage with these groups. Additionality required.

RH – SG's letter does clearly state what is required for funding with RH agrees with but measurement methodology is flawed. RH worried in 3 years if asked how to measure success will take them down another road and strategic objectives will not be achieved.

?? this should be an opportunity to back to SG with how this can be achieved and find out how SSCN as a network can achieve it.

JS – asked RH if he had any ideas on how this can be achieved, what measurement techniques is RH suggesting?

RH – something along the lines of the transactional framework. RH worried re ticketed visitors. Science centres are not about kpi's and they are there for a guide for achieving objectives.

PJ – difference in the left hand column is what SG want us to do. Kpi's presented are to deliver what SG have asked for. Have to decide if SG are right or wrong.

KR – this will be a challenge. Document does not inspire to share information through SSCN. SSCN should not fight for funding. General agreement will not be reached through this document. The whole basis for the funding is flawed.

JS – this model is not unique and is used by the Scottish Funding Council. KR advised that this was not the case.

KR – model started with FE colleges, was not successful and was reviewed and changed at a cost of £5m. Funding for university courses are finely tuned as to what each college/university offers. Every college and university is resourced according to the package they offer. Definition from Funding Council points in different direction to SG proposal. Edinburgh and Glasgow universities are comparable in most things, other universities have different locations, mixed economy, underlying principles apply.

SM – setting aside funding issues, which of the strategic objectives would be to increase visitor numbers to science centres. There are areas that would identify, such as outreach, CPD, engagement with schools. Perhaps there are other SG departments who should be approached, not just OCSA.

KR agreed that we should be approaching other departments of SG. Fundamental that the methodology that is being applied is not going to help SSCN work together. All science centres are providing a different experience but with the model proposed, GSC would have to level down their experience.

JS – suggested rather than trying to get more of the funding from OCSA this should not be the limit of what we are doing as organisations. In terms of aspiration, aims and objectives, getting to C2,D,E's. ODE/Sensation will benefit from the funding offer, SSCN should assist GSC in argument with another SG department.

RH – this is slightly against where the SG has been going in the last 5-7 years. Before OCSA set up, no strategy existed re public engagement, no cohesion, brought under one umbrella – SSCN. GSC sat in a number of different camps, ie education, life-long learning, climate change (energy policies). For SSCN as a network to demonstrate that we are a unique resource and asset to Scotland and have a huge role to play. We will be too busy to sit down together to meet with other SG departments if proposed model is implemented.

KR – had conversations with other departments who are bemused with OCSA's limited approach. Understanding was for SSCN to go to other departments who are happy to look at additionality. There are some issues that are affecting the kind of reactions GSC get at the moment and in the future.

JS – things are not as grim as RH suggesting. Unless dramatic change in visitor numbers, only a definitive pot of money. Just being divided up in a different way. Basis for the last 3 years was as a result of the Jura Report.

KR – GSC got £1.2m less than Jura said we would need to stay operational. GSC has..... £1.2m and no capital support. KR annoyed that we get GSC back on track and then to be based on less than £0.7m funding.

JS – Understand why KR feels frustrated but finite funding whether based on business plan or visitor numbers. Answer is that we have to go elsewhere for additional funding. If GSC get bigger funding from OCSA then this will affect the other science centres within the network.

PJ – the disconnect is the funding mechanism. If this had been based on the Technopolis approach, then this discussion would not be taking place.

KR – funding mechanism fundamentally flawed which will always create problems and aspirations will not be achieved. This will not produce outcomes.

PJ – in terms of timescales working towards, and in terms of GSC position, can we have a discussion where we are heading towards in terms of the 31 March response deadline. Only GSC has challenges with the proposal, Sensation ok, ODE comfortable and has spoken to the board at Satrosphere who are also ok.

KR – does not see any means of a common agreement amongst SSCN as not providing the same for the same price. Nothing to do with outreach and + competitive re fixed sum of money. If any success with SSCN, fight re money has to go away. Even if agreement reached for first year, only a matter of time before someone stitches up someone, if opportunity presents itself.

PJ – challenge that needs to be addressed. To do this we need to reach some form of agreement. PJ has written to minister to thank SG for the funding announcement. KR – GSC has not written to SG.

PJ – in terms of what has been discussed, carries a risk agenda but would like to have a better understanding of the level of risk which will determine how we move forward as a network.

KR – one reason – crossed KR's mind that there are various mechanisms that could be employed to produce 1m visitors for GSC next year. Opportunity for gaming to take place. This would create problems for SSCN as a network. Create gaming mentality.

JS – numbers capped at 600k.

RH – numbers are not capped, everyone gets a %age. Whether or not capped at 600k, would have an impact from a network and politician point of view.

SM – now convinced significant risks in strategy, short term wins, no sustainability. Would be shocked if anyone went down the gaming route.

KR – this tactic has been used to prove the system wrong. Model has so much evidence of how to go for it. Does not stand scrutiny.

JS – Understands KR's predicament and PJ asked where we should go from here. All in a situation of trying to run science centres as best we can but not taking anything any further forward. SG asking for a response by 31 March. JS thinks GSC not in a position where GSC can work with JS/PJ. At last meeting talking about..... Looking at measurement criteria has produced issues that have not been resolved. PJ/JS need to make a decision for them – do we have a year of trial for benchmarking.

PJ – KR thinks funding model is flawed. Approach where PJ expects GSC to go back to OCSA to say unhappy with funding model but that is not to say any agreement will be reached on No. 1.

KR – would not expect transactional approach and nothing in document that GSC do not measure already but wrong measures for strategic measures. KR does not have issue with objectives but does in terms of general measures. KR – need to look at measures that are the hard ones re attitude change and use glo's as the basis to do measures.

PJ – kpi's are fairly simple and are no recorded by ODE or Sensation. This is an outputs based model and these are kpi's that will not be relevant in 2 years' time. Document is a starting point which reflects the government timeline.

RH – PJ talking about putting systems in place to measure kpi's. By the time we get round to measuring, will be pointless, only about getting visitors through the door and counting heads, not about a science experience. Only measuring attitudes and white middleclass children.

PJ – volume measure, quality measure in terms of learning experience and value for money elements. Funding mechanism will drive focus on numbers.

RH – why is PJ only starting to do this now? Should have been doing this in the past but this is not what the funding is for. Should have aspiration for all science centres to be ingrained in their city's culture. Present funding model does not allow for that to happen. Still going to be governed by visitor numbers.

PJ – does not have to exploit one over the other and wants to develop a much rounder, fuller science centre. Opportunity, because of the SG, to make a better science centre.

KR – GSC has been doing this for years. GSC board driving this forward.

JS – no-one disagrees but ODE/Sensation getting opportunity they have never had, the answer is to look at other funding sources, but KR sees the mechanism forces them. If all do the same as in 2006/07, numbers are the same this year, therefore margins will stay the same. Based on what is being tabled, there should not be a fight and will only be one if we allow it.

SM – this will provide leverage to go to other funding sources.

KR – Scottish money should be spent on Scottish population and nothing else. From a strategy point of view, 429k Scottish visitors. Being dishonest for national interest. Still an issue about that funding model supports tourism or science engagement.

JS – nothing to be benefited by going down that road.

RH - badly worded letter. What is the network to JS?

JS – network is a collective of the 4 centres where we can work together in a way that benefits us all, adds more value, unconfirmed partnership.

PJ – same. Potential for competition with other centres because of similarity/difference that we have. Goes back to business issue that has to be the primary focus.

RH – at the end of the last meeting in ODE, got that impression but have to report to individual boards. Network has to agree a common framework but might have to review if SG advise this doesn't work for them. This goes back to the 3 centres happy with the proposal but GSC not, but it is the mechanism that KR not happy with.

RH – SG have always looked at funding model for SSCN as a network, seeing it as 1 entity. So, if no agreement,

JS – thinks emphasis on the network has decreased re SG. SG realisation that the centres are different. Last meeting of the network was in W5 with IB 2 years ago.

RH – then why the HMIe review in 2006 which looked at all 4 centres as one and reported as one.

KR – try to do something productive. KR thinks the network has a strategic advantage for Scotland but needs all network centres in tune with each other. Model breaks down opportunity to have a genuine advantage for Scotland. Where separate local entities or not is not an issue but is an issue if members of the network fighting for survival. Need to get past this from a point of view of the national interest. Not about 4 science centres but about asset based and how it is employed. Never going to agree and accept but what can we do to move this forward.

Break for lunch 1350

Reconvene 1415

PJ – part 2 of the meeting is about how we reach agreement or consensus of how we move forward. Framework has to be acceptable. Agenda in the first half is that the funding mechanism is applied. SG has set out initial kpi's that might be useful. PJ thinks that there is not massive disagreement re kpi's but over funding mechanism. Kpi's could become more sophisticated over time.

KR – No. 1 – difference will be made via outreach, about what where people are.

SM – need to be aspirational about driving visitors into the centre.

KR – visitors are not the driver.

SM – if he in KR's position, still want to see more visitors through the door.

KR – about what trying to achieve and generate more profit by have less gross value. In the Glasgow market outreach has the most impact.

RH – headline kpi has to be made up of other measures to produce aggregate result. Need to be careful and kpi needs to have other measures to allow clearer picture of what is happening and what actions should be taken to address.

SM – are we under-valuing GSC as an asset?

KR – yes as GSC not allowed to count visitors. If KR looks at mechanism available to best achieve aspirations, not in-reach visitor led.

PJ – Agreed. Sensation does a lot of outreach. Accepts that that is not what the government is interested in. SG interest in in-reach and science centres have natural assets to carry this out.

PJ – challenge re agreement as the decision to be taken is a network decision.

KR – does not have a problem in looking at numbers of people through the door. Response that GSC makes to SG will not rest on that alone. From that point of view there is an issue.

SM – definition of what age a child is as different definitions – SSCN have to have a common definition.

JS – does GSC allow 17/18 year olds in as children? In ODE under 3's are free but counted as a visitor.

KR – GSC does not count under 3's. GSC has c.20k under 3 visitors pa.

PJ confirmed that Satrosphere and Sensation count under 3's.

KR – have to be clear about child definition. National curriculum based on 3-18's.

PJ – how do you distinguish between 16/17/18's.

KR – all SSCN bookings based on 3-16.

JS – happy to call it 3-18.

KR – GSC also have a number of groups coming into the centre for debates.

RH – why count it?

JS – this information is for the funder and give an indication of how many children going into science.

PJ – re interviews, asked about definition of visitor, child was one of the key categories. Define different age groups.

RH – headline number of visitors then break down into visitor categories.

KR – can get indicators through evaluation programmes, such as social or deprivation zones. If all centres set up for 3-16

Agree visitor categories:

JS – OAP's count as concession.

KR – retired persons

PJ - in the second objective 'Scots of all ages'

PJ – C2,D,E

RH – queried pre-booked education visits

PJ – Sensation have schools button which takes into account organised groups whether schools or groups

RH – are all the groups counted? Nursery, Irish schools, etc.

PJ – have to look at lcd. Do not separate primary and high schools.

KR – suggested that this is a requirement. Perhaps the way to do it is to stick with national definitions, eg early age, primary and secondary

PJ – will take a year to establish a base line

KR – trying to define what is believed to be the correct approach. Implementation issues.

RH – useful thing to know how to split primary numbers into pre-5, P1/2, P3/4 etc. as are completely different audiences. ODE collate information to engagement with Scottish schools. Groups should be Pre 5, P1-3, P4-7, S1-2, S3-4, S5-6 and others. Have to agree what is going to be recorded in the future and will help to decide what areas to target resources in the future.

Group definition of a pre-booked education visit – the above groups are those associated with formal learning.

KR – groups such as special needs.

RH – information extracted re breakdown of ASN, teachers, etc.

PJ – 'other groups' option should mop up.

RH – origin of school? Language schools?

KR – practical solution to stay with 'others'

PJ – category and possible need to identify change in the next few months.

RH – children as opposed to schools?

KR – No. 11 penetration into schools as well as schools population important.

PJ – No. 4 in part way addressed by talking in terms of postcode capture. Disabled, black and ethnic groups. Lessons to be learned from others who are already collection this information, eg DCMS organisations.

KR – why are they lumped together?

PJ – have to separate ethnic and disabled visitors

KR – talking about national policy interests in the C2,D,E social groups which should be reported. These are the groups that are high value impact. C2,D,E should be a number not including disabled.

PJ – postcode capture

JS – ODE try to get as many postcodes and Catriona Cardie does analysis. Every visitor asked for postcode.

KR – need to be clear that analysis is not precise but an indicator.

KR – visitors – want to be clear re corporate event visitors. ODE count as separate group so do not affect reported numbers. KR interested in these visitors from point of view of raising awareness. KR would not expect public funding to pay for CH visitors but should be acknowledged from a public science aspect.

SM – 40% of events activity at ODE. Related to objectives for ODE as a focus for science engagement. Useful parameter to be noted.

JS – can put together a set of kpi's appropriate to demonstrating science activity.

KR – undervaluing any asset is not showing how facility being deployed. ODE visitor numbers substantial at 100k.

RH – CH events need to recognise contribution within the network of schools makes all CH market as some events booked

JS – does not want to tie up staff to drill down into this. JS happy not to include CH visitors but does not want to employ someone to do this.

PJ – all agree that this is useful information. Better for PJ as he does not have the resources.

JS – have a core that we buy into

PJ – this would be useful.

SM – had discussion with HMle about use of corporate space. 40% of activity was related to science. Measure for obtaining this information is not burdensome process and better to get %age figure which indicates type of activity.

PJ – Sensation does this through ticketing system. Satrosphere would not be able to produce this level of detail.

PJ – No. 5 – retired people – agreed.

No. 6 - %age ticketed visitors satisfied with science centre service. How do we measure? Currently recorded in different ways. Will need to have a common survey. Eg Lynn Jones.

KR – GSC carry out quarterly evaluation survey across numerous categories. GSC typically score 8.5.

PJ – feasible for Sensation to carry out quarterly surveys.

RH – does this include only family visitors? How do we incorporate level of satisfaction outside family visitors?

RH – this should be done in a uniform process across the network with some questionnaires, some comparators etc.

PJ – sample sizes.

KR – GSC has sample sizes.

PJ – has spoken to Lynn Jones.

GSC use Lynn Jones quarterly.

RH – need to have common principle to work together.

KR – GSC still has significant European reporting which makes survey more extensive but things that affect GSC commonly. LJ costs £14k pa and RH advise because of funding GSC has to carry this out.

PJ – opportunity to speak to visitors to extract useful information.

RH – need to talk about methodology.

KR – LJ work more extensive than what is required for network but areas that affect SSCN commonly are in the survey that gets done in GSC. All agree customer satisfaction to be survey-based model.

Item 7 – Learning outcomes based kpi for education visitors.....

RH – looking at QA framework to evaluate activities etc

KR – QA framework would not address HMle rating.

KR – thinks No. 7 is appropriate and where we need to be going.

PJ – will take time but doesn't affect SG.

KR – some measures already in place that would apply easily and well. Any education visitors operated frameworks already in use that could be applied.

PJ – No. 8 HMle

SM – qualitative approach. SM would not want to move away from to something like VisitScotland measure.

RH/KR HMle approach is an added value.

RH – HMle beneficial as they identify strengths and weaknesses.

KR – would not have this in, described as hygiene factors. How manage and deal with actions different to each organisation. Minimum standard but HMle report is 'no essential recommendations' following from the report.

RH – important as HMle have an agenda.

KR – if HMle identify recommendations as essential then that is the case.

KR – in last report, HMle did not use 'essential'

PJ – had discussion re Satrosphere and asked re priority areas. Satrosphere had 3 issues.

PJ – HMle review due 2009.

KR – SG should be calling HMle survey a hygiene factor. If you have understanding recommendations that have not been addressed and will have to produce action plan for continued funding, have to demonstrate working towards targets.

KR – SG makes this a condition of providing service.

PJ – agree with JS that SG communicate with HMle.

KR – HMle should be hygiene factor and before each year starts, should be a review of what action planned on hygiene factors and clear statements.

It was agreed that No. 8 does not belong in the performance framework.

KR/PJ – same for no. 9 – Remove.

No. 10 – programme/activity links with Curriculum for Excellence.

SM – operational encompassed within HMle.

RH – SG will expect us to produce new materials ensuring these are included in the CFEx.

RH – before we get to kpi's have to make sure that the strategy in place to ensure that strategic objective is the right objective.

KR – if going to achieve ambition, can only do in conjunction with teachers if doing this correctly. A lot of work to be done in getting a clear defined scheme of work and not represented in the model as it stands. Areas only high costs and high resources involved to do correctly.

KR – 2nd part different altogether. Wrong measure but an indicator at the moment if what we are actually trying to achieve in due course. Useful proxy.

JR – asked RH – opportunity for feed back from teachers?

RH – where HMle coming, from we are very good at the one-off hit. One of the headline indicators is the time of visit and taking up of resources provided. As well as questionnaire together indication of success in approach.

KR – proxy is identified curriculum elements that programme is intended to support. Has to do with formal education system. Evaluation in use will identify in long term.

SM – not at the stage where this can be done for CFEx.

SM – real opportunity for science centres to produce exemplars.

KR – getting visiting schools at the moment, universal support for this approach.

KR – not peer reviewed materials whether demonstrated, whether curriculum links applied plus research-led public engagement. Proxy at the moment re number of events or audience numbers leading to qualitative assessment.

No. 11 – KR – such as access to schools as well as schools population.

RH – look at setpoints. Full business plans have been submitted for contracts to start in August 08.

KR – reasonable to have a %age share at this stage.

SM – important to take into account number of schools and the pupils.

KR – need to be proportionate.

RH – all information re regional outreach can be obtained from SG website.

No. 12 – Number of knowledge-transfer partnerships with HEI's

PJ – output from partnership can be funding or technical advice for new exhibitions.

KR – could have 2 relationships for 2 entirely different purposes. Proxy – number of achieved relationships in the first instance and in due course develop a qualitative framework.

JS – is it worthwhile defining 'active'?

KR – we need to have qualitative performance framework to work within.

No. 13 –

JS – 12/13 need to be annual in terms of frequency of measurement which will possibly lead to detailed annual report.

No. 14 Number of conference papers delivered

RH – aspiration ok but measure not right. Needs to be more encompassing, will be different for all although some common ways, but unique.

Revisit and expand re how SSCN acknowledge within the sector.

KR – start with international associations and grow.....

Nos. 15-19

PJ – need to be careful about being drawn into ratios.

KR – less relevant for ministers than anyone else.

JS – closely linked to No. 1.

PJ – put this in as Historically.

No. 16 – Net income from trading. Part influenced by interviews and part by DCMS targets.

KR – does not agree with way of achieving. This should be about the health of charity and financial profile. KR – should be presented 'what is financial profile of the business, activities, grants, awards, public funding etc'. This would align with ASTC data. Provides a figure for benchmarking. Should be %age deducted income, commercial income, charitable grants and awards, public funding.

16 and 17 to be put together.

JS – should expenditure be measured against different income categories.

KR – core operations and believe better than others at getting core grant to support activity. Look at least 3 years accounts to see how business is doing. Profile is comparable from year to year and across various boundaries.

PJ – cannot benchmark against each other.

KR – advised IB if GSC cross benchmarked internationally, GSC in very good position.

JS – kpi's 1-19 not comparable between SSCN.

KR – comparators within ASTC data. Development beginning to move towards qualitative measures which will provide useful information. Drive should be towards qualitative side of measures rather than quantitative.

RH – we should not be looking to compare against each other.

JS – suggested using ASTC profile as a benchmark for SSCN.

KR – GSC members of ASTC and in possession of data. Not good data, but sufficient to identify where science centre is in position against other science centres.

JS - £7.5m between 4 centres is not enough. Value 4 centres, need £10m. Politicians need to appreciate centres as assets.

KR – referred to Halcrow report.

JS – requested KR share ASTC information.

KR – advised GSC members of ASTC. GSC unable to share data as information licensed to KR.

PJ – advised JS to purchase ASTC Sourcebook.

PJ – requested KR make recommendations re ASTC.

KR – GSC doing peer review with ASTC to provide qualitative definition of how things are interpreted. KR will look at comparators.

18 – cost per visitor

Is a factor associated with profile, this is appropriate but not as a standalone but in a broader context.

19 – Efficiency savings

KR – public experience is about results achieved in public interest. Only relevant if you have appropriate benchmarks. Need to agree beneficial outcomes. Effectiveness before efficiency.

Worthwhile revisiting but agenda items for each individual centre rather than a network objective.

Do not include within kpi's.

PJ – what happens next in terms of 31 March? Part response agreed that document is a But not agreed unanimously with funding mechanism.

KR – not a full agreement but a partial agreement on issues that are helpful.

PJ – will produce a slightly more refined version for submission to OCSA.

JS – important that each centre speaks for itself rather than each other.

KR – submission to OCSA will incorporate this document as well as other issues.

PJ – need to look at reporting framework.

KR – will state clearly that the quarterly performance and claw back should not be employed in any circumstances. Destroys philosophy of each centre managing its own affairs and operational issues.



PRIFYSGOL CYMRU
THE UNIVERSITY OF WALES

ANNEX 1

PROFESSIONAL DEVELOPMENT PORTFOLIO

PAUL JENNINGS

2009

UWIC

Cardiff School of Management
Colchester Avenue
Cardiff, UK, CF23 9XR

TABLE OF CONTENTS

PROJECT ONE: SATROSPHERE SCIENCE CENTRE

PART ONE – ACADEMIC LINKS, DEFINING THE PROJECT, EARLY INTERVENTION AND SKILL AND RESOURCE REQUIREMENTS

1.0	LINKING PROJECT ONE WITH MY ACADEMIC RESEARCH	1-2
2.0	DEFINING THE NATURE OF THE PROJECT THAT WAS INVESTIGATED	1-2
3.0	THE PERSONAL SKILLS I REQUIRED IN ORDER TO TACKLE THE PROJECT	1-4
4.0	EARLY INTERVENTIONARY ACTION TAKEN	1-4
5.0	RESOURCES REQUIRED IN ADVANCING CRITICAL ORGANISATIONAL CHANGE	1-6
6.0	THE DEVELOPMENT OF MY OWN SKILLS	1-7
6.1	The personal development/training undertaken in developing my skills base	1-8
6.2	Factors which hampered my progress	1-9
6.3	Skills required in order to improve my performance as a more effective manager	1-9
7.0	THE CONTRIBUTION OF WORKING WITH SATROSPHERE IN ADVANCING MY ACADEMIC DEVELOPMENT	1-10
7.1	The contribution of my research to this project	1-11

PART TWO – SELF REFLECTION EXERCISE

8.0	AREAS OF STRONG DELIVERY	1-12
9.0	EARLY OUTPUTS FROM AN INVOLVEMENT WITH SATROSPHERE	1-13
9.1	Benefits to my professional development	1-13
9.2	Benefits to my employer	1-13
9.3	The main learning outcomes I have met	1-14
10.0	RE-IDENTIFYING THE PROBLEMS THAT HAVE BEEN ADDRESSED	1-15
11.0	THE RISK PROFILE ASSOCIATED WITH THIS PROJECT	1-15
12.0	PLANS FOR PROGRESSING SHORT/MEDIUM TERM CAREER DEVELOPMENT	1-16

PROJECT TWO: SCIENCE LEARNING CENTRE

PART ONE – DEFINING THE PROJECT, ITS LINKS WITH MY ACADEMIC WORK, EARLY INTERVENTION AND SKILL AND RESOURCE REQUIREMENTS

1.0	LINKING PROJECT TWO WITH MY ACADEMIC RESEARCH	2-2
2.0	DEFINING THE NATURE OF THE PROJECT BEING UNDERTAKEN	2-2
3.0	THE PERSONAL SKILLS I REQUIRED IN ORDER TO TACKLE THE PROJECT	2-4
4.0	AN EARLY CHALLENGE	2-5
4.1	Organisational resourcing requirements	2-6
5.0	SKILLS ENHANCEMENT AND PERSONAL DEVELOPMENT	2-7
5.1	The Noyce Leadership Institute	2-7
5.2	Future development needs	2-8
6.0	THE CONTRIBUTION OF WORKING ON THE SCIENCE LEARNING CENTRE PROJECT IN ADVANCING MY ACADEMIC DEVELOPMENT	2-9

6.1	The contribution of my doctoral research in advancing the Science Learning Centre project	2-10
-----	---	------

PART TWO – SELF REFLECTION EXERCISE

7.0	AREAS OF STRONG PERFORMANCE	2-11
7.1	Benefits to my professional and academic development	2-11
7.2	Benefits to my employer	2-12
7.3	The main learning outcomes I have met	2-12

APPENDICES

Appendix 1	Offer of Operational Grant Instalment
Appendix 2	Invite to Conduct Business Review
Appendix 3	Whole Business Review - Satrosphere Science Centre
Appendix 4	Satrosphere Business Plan 2008-2011
Appendix 5	Government Briefing Note to Study Consultant
Appendix 6	DSC Section of Science Learning Centre Study
Appendix 7	Grant Application – Dundee Science Centre Feasibility Study
Appendix 8	Progress Report and Draft Project Initiation Document

PROJECT ONE

SATROSPHERE SCIENCE CENTRE

PART ONE – ACADEMIC LINKS, DEFINING THE PROJECT, EARLY INTERVENTION AND SKILL AND RESOURCE REQUIREMENTS

1.0	LINKING PROJECT ONE WITH MY ACADEMIC RESEARCH	1-2
2.0	DEFINING THE NATURE OF THE PROJECT THAT WAS INVESTIGATED	1-2
3.0	THE PERSONAL SKILLS I REQUIRED IN ORDER TO TACKLE THE PROJECT	1-4
4.0	EARLY INTERVENTIONARY ACTION TAKEN	1-4
5.0	RESOURCES REQUIRED IN ADVANCING CRITICAL ORGANISATIONAL CHANGE	1-6
6.0	THE DEVELOPMENT OF MY OWN SKILLS	1-7
6.1	The personal development/training undertaken in developing my skills base	1-8
6.2	Factors which hampered my progress	1-9
6.3	Skills required in order to improve my performance as a more effective manager	1-9
7.0	THE CONTRIBUTION OF WORKING WITH SATROSPHERE IN ADVANCING MY ACADEMIC DEVELOPMENT	1-10
7.1	The contribution of my research to this project	1-11

PART TWO – SELF REFLECTION EXERCISE

8.0	AREAS OF STRONG DELIVERY	1-12
9.0	EARLY OUTPUTS FROM AN INVOLVEMENT WITH SATROSPHERE	1-13
9.1	Benefits to my professional development	1-13
9.2	Benefits to my employer	1-13
9.3	The main learning outcomes I have met	1-14
10.0	RE-IDENTIFYING THE PROBLEMS THAT HAVE BEEN ADDRESSED	1-15
11.0	THE RISK PROFILE ASSOCIATED WITH THIS PROJECT	1-15
12.0	PLANS FOR PROGRESSING SHORT/MEDIUM TERM CAREER DEVELOPMENT	1-16

twenty years the centre, based in Aberdeen, has established itself as a popular community resource with locals but one which has struggled to establish a profile beyond a very local audience.

Over the period of several years Satrosphere, like many science centres, has encountered a number of trading difficulties. These finally came to a head in mid-2007. This was alluded to in a frank and critical position statement prepared by Satrosphere's Chief Executive at the time, Graham Shanks. This paper began to signpost the seriousness of Satrosphere's position and contributed to Scottish Government decisions to freeze its revenue-based funding of Satrosphere. This decision looked to accelerate Satrosphere's declining financial health, if left unchecked.

The approach by then Satrosphere Chairman, Dr Hugh Morel, came at a time (August 2007) when I was nearing the data collection phase of my doctoral thesis. Dr Morel requested that I conduct a whole business review of Satrosphere, essentially an organisational health check, in efforts to identify the means with which Satrosphere could begin to affect a recovery and the re-release of Government funds. Confirmation of my review and further details of the nature of my review are recorded in appendix two. In addition to inviting me to carry out the organisational review, Dr Morel also invited me to attend the Satrosphere Board meeting of 31st August 2007. During the course of this meeting it became apparent that Satrosphere was, technically, operating insolvently. The nature of financial difficulty, which only surfaced in the meeting, was such that Directors discussed whether they should cease trading immediately. Following this discussion the Satrosphere Board agreed to continue trading until I had carried out my review and reported my findings.

In addition to conducting my health check of Satrosphere Dr. Morel also asked me to identify and present recommendations to the Satrosphere Board over how Satrosphere might move forward. I conducted my review the following week and presented my findings back to Directors the week after that.

3.0 THE PERSONAL SKILLS I REQUIRED IN ORDER TO TACKLE THE PROJECT

As the Chief Executive of a science centre in Dundee (Dundee Science Centre, DSC) I had been in post for six years before getting the request for assistance from the Satrosphere Chairman. During this time I have delivered a full financial turnaround in a science centre of similar size, led the successful pursuit of over £4m of funding, typically on a competitive basis, and delivered consistent break-even positions. The skills I have been able to develop while in Dundee, coupled with those developed while managing commercial visitor attractions for Merlin Entertainments Group, the world's second largest visitor attraction operator, have equipped me with the leadership and management skills to provide the type of support critical to Satrosphere during such a difficult period. A skill of particular benefit to Satrosphere is my proven ability to identify the causal factors relating to key issues during periods of crisis, identify the necessary resources and affect the required corrective action. The nature of Satrosphere's financial position was such that immediate corrective was critical if the centre was to stand any chance of recovery.

4.0 EARLY INTERVENTIONARY ACTION TAKEN

Handling such a sensitive situation required a structured approach to carrying out my review of Satrosphere. I have previously mentioned that the major aim of my initial investigation was to provide a detailed report to the Satrosphere Board which would

allow them to make better informed decisions about the centres future and the nature of corrective action required. Conducted during the course of a working week my review included individual meetings with as many members of staff as possible, meeting or speaking with as many Board members as possible and reviewing key strategic documents including business plans, previous Board minutes, management accounts and correspondence with major stakeholders.

Interviews were conducted in a spirit of openness and confidentiality in efforts to form a clear and accurate picture over the actual situation at Satrosphere. Everyone interviewed was candid and this was very useful in clarifying a wider context to the one presented by Satrosphere's sketchy financial statements. This aspect of my review was a key one in identifying the necessary course of corrective action.

Having collected a significant amount of data during the week I spent the following weekend writing up my findings, including identifying and prioritising recommendations and a full options appraisal. This report, titled "*Whole Business Review – Satrosphere Science Centre*" (see appendix 3), was presented to Satrosphere Directors on the 10th September 2007, ten days after my initial meeting with the Board. At this Board meeting I presented twenty nine major recommendations (see appendix 3) around the key themes of finance, management and efficiency and effectiveness. The early address of financial issues would be critical if recommendations around management and efficiency and effectiveness were to be progressed. Early recommendations in the report included that the Chair of the Board should resign and that redundancy discussions should commence with the Chief Executive and seven other members of the Satrosphere management team.

The options for moving Satrosphere forward were a) close Satrosphere and engage liquidators, b) reduce staffing to operational staff only and operate a turn-key operation for the foreseeable future, c) enter into discussions with a similarly focussed organisation in an effort to secure early operational support and a shared leadership and management structure. The Board opted for option c. and duly entered into a dialogue with DSC. Following these discussions DSC engaged in a management contract arrangement with Satrosphere for an initial six month period. This was extended to a minimum two year contract in April 2008. At this time I was appointed to the role of Chief Executive of Satrosphere.

5.0 RESOURCES REQUIRED IN ADVANCING CRITICAL ORGANISATIONAL CHANGE

The critical nature of my initial involvement in Satrosphere meant that I had very few resources at my disposal. The major support provided was in being able to have my management team in DSC support me. This enabled me to be absent from Dundee for my review week. It was also very important to have the support of my own Board in effectively releasing me from duties for the week.

At the point where Satrosphere agreed to work with DSC, under contract, a new approach to supporting Satrosphere was required. Beyond my initial review there was gap in DSC's input of a month while the new Chair of Satrosphere (appointed immediately following the resignation of the previous Chair) managed through the redundancy process.

DSC's official involvement with Satrosphere started on the 1st October 2007 and in the intervening weeks several members of staff had handed in their notices because they felt the financial health of the organisation was unrecoverable. The fragile nature

of Satrosphere's position was such that it could have very easily closed had any more staff decided to leave. The absence of contracts of employment was not helpful in this regard with many of the staff leaving without serving any notice period.

In efforts to support the greatly slimmed down team at Satrosphere I made an interim restructuring of my DSC team to provide essential operational, commercial, human resource and marketing support to Satrosphere.

During the first six months of involvement in Satrosphere the Dundee team had affected change which had reduced payroll costs in Satrosphere by over £250k, released frozen Scottish Government funds amounting to £80k and secured additional government funding amounting to a further £110k. All this achieved in an organisation with an annual turnover of c.£600k. Much of the additional funding was secured on the basis of DSC advancing areas of development identified by Her Majesty's Inspectorate of Education (HMIE) following their inspection of Satrosphere in late 2006. I was also able to secure DSC's management fee, from the government, for supporting Satrosphere from 1st October 2007 to 31st March 2008.

6.0 THE DEVELOPMENT OF MY OWN SKILLS

The review of Satrosphere, and importantly what has followed, has enabled me to gain considerable further experience in effectively managing major change at a senior level in an organisation. The breadth and depth of issues facing Satrosphere and the subsequent need to manage these through has tested me on many levels, personally and professionally, and given me the opportunity to further develop my decision making and leadership skills.

Taking on a second Chief Executive role, in a second independent registered charity, has been a further challenge in itself in terms of continually dividing my time and focus between the very different needs of both science centres. Now (October 2008) some twelve months on from taking on the senior executive role in Satrosphere, I feel I have matured considerably in my approach to leadership and management.

6.1 The personal development/training undertaken in developing my skills base

The nature of both initial and subsequent requests by the Satrosphere Board was such that personal development has taken place as a result of being involved - I've learnt and developed as a direct result of doing the job.

In addition to the considerable hands-on personal development I have experienced during the last thirteen months, I was invited to join a US-based international leadership programme for senior science centre executives in December 2007 (the Noyce Leadership Programme). The programme, which started in June 2008, has many elements which have, and will continue to, benefit my leadership of both organisations. Features associated with participating in this nine month programme include:

- A leadership development program dedicated and applied to the science centre field;
- A framework and benchmarks for effective leadership and customised feedback on leadership style;
- A framework and tools for continuous strategic thinking, positioning, execution, and innovation;
- Guidance on the creation of participating science centre's strategy and plans;
- Guidance and support to complete a special project or initiative of benefit to the participants institution;
- Tools to assess institutional capacity to sustain ongoing innovation;
- Tools for discovering data about community and publics;
- New frameworks, ideas, and tools for sustainability and economic viability;

- Leadership and organisational consulting tailored to individual and institutional needs and context;
- A trusted peer network and “community of practice,” and connections to valuable resources and counsel.

The development opportunity afforded by participating on this inaugural leadership programme, with sixteen other science centre Chief Executives, is clearly a significant one.

In addition to the opportunity afforded by participating on the Noyce Leadership Programme Satrosphere benefited from a significant deepening of the reflective practice and critical thinking skills developed during the course of my doctoral thesis. This is particularly noteworthy on grounds that the effective turnaround of Satrosphere ran in parallel with the final stages of my research process.

6.2 Factors which hampered my progress

The absence of sufficient resources within Satrosphere, coupled with the advanced state of decline in financial health of the organisation were major barriers to early progress. Now (October 2008) over a year into my involvement with Satrosphere I am slowly building the resource base in the science centre having now overcome many of the financial and operational difficulties that presented themselves on first arrival.

6.3 Skills required in order to improve my performance as a more effective manager

A major challenge on my current effectiveness as a manager are the number of external demands I have on my time. These include Chairing three external organisations and sitting on the steering groups of at least another three groups. I am currently in the process of stepping away from several of these commitments in efforts to dedicate more time and focus to both science centres.

In addition to scaling back my external commitments I need to further improve my time management skills in maximising my effectiveness. Participation on the Noyce leadership programme will help this as a result of specific time-management modules. I am also currently in the process of hiring an administrative assistant who will support a new executive Directorship I have created within DSC.

7.0 THE CONTRIBUTION OF WORKING WITH SATROSPHERE IN ADVANCING MY ACADEMIC DEVELOPMENT

My involvement in Satrosphere has improved my analytical, observational and decision making skills. The nature of organisation and future demands on how it becomes more effective in engaging a visiting public with a science learning agenda will help support a future research and evaluation base which I hope to drive. The opportunity of combining this with similar aspirations in Dundee is that this agenda is likely to move forward much more quickly. The next stages in advancing this aspiration are:

- Completing my current professional doctorate studies;
- Producing several papers from my thesis in efforts to further develop my writing skills;
- Securing a full financial turnaround of Satrosphere by 31st March 2009;
- Recruiting a full time research post in Dundee, potentially through a knowledge-transfer partnership arrangement;
- Identify a clear research agenda around science centre effectiveness and initiate pursuit of tackling this.

The majority of these early measures will be commissioned from Dundee but will see Satrosphere become an early benefactor given its close links with Dundee.

My work with Satrosphere has also given important stability to an organisation that on first engagement was in an accelerated state of decline. In safeguarding the short and

medium term future of Satrosphere I was able to conclude my research aim and in doing so complete my doctoral investigation.

7.1 The contribution of my research to this project

Satrosphere is one of the best examples of why science centres need clear and well-defined performance indicators. The cyclical financial issues faced by Satrosphere has put pressure on the Scottish Government to support them (financially) or allow them to go out of business.

My involvement in Satrosphere started almost half way through my professional doctorate programme and in addition to underpinning the importance of visible performance indicators, also re-enforced the need for clear accountability guidelines in the relationship between science centre and sponsor, whether government or other. My doctorate research clearly identified that governments should not support failing science centres and so the framework which emerged out of my thesis will demand a more responsible approach to operating by Satrosphere moving forward. This is now happening, under my leadership, but should also prevent any future lapse in performance as the new framework provides early warning signals of this possibility.

PART TWO – SELF REFLECTION EXERCISE

8.0 AREAS OF STRONG DELIVERY

Satrosphere continues to trade and this is perhaps the best demonstration that positive change has taken place in Aberdeen. The demands facing Satrosphere were numerous and varied and progress has been made in moving the whole organisation forward during the last year. The Satrosphere business plan (see appendix 4) for 2008-2011 sets out the recent context for change and signposts many of the early milestones in moving Satrosphere forward. This three year plan sets out the strategy for the next three years and by year.

The recent changes in Satrosphere's financial performance are a very clear signal of the improvements that are taking place. In 2005 Satrosphere made a financial loss of £230k for the year. This was a transition year during which Satrosphere changed its year end date from 31st December to 31st March – effectively making 2005/06 a fifteen month year. In the year from 1st April 2006 to 31st March 2007 Satrosphere made an operating loss of £218k. Following six months of input from my team and I (1st October 2007 - 31st March 2008) Satrosphere almost halved its operating losses to £118k. This achievement, after just six months, is all the more impressive for the fact that this year all included a significant amount of redundancy payments. Now (November 2008), half way through 2008/09 Satrosphere has delivered a breakeven performance for the half year and is budgeted to breakeven for the year to 31st March 2009.

That my DSC team was both ready and capable of making such a significant early impact is testament to the skills which they have developed during their time in Dundee. Over and above skills and experience the commitment, resilience and energy

levels consistently demonstrated by members of the DSC team was a significant determinant of these early successes.

9.0 EARLY OUTPUTS FROM AN INVOLVEMENT WITH SATROSPHERE

9.1 Benefits to my professional development

Now Chief Executive of two science centres in Scotland the benefit of my initial involvement is that I am now moving forward two organisations that have a growing number of structured synergies. This is perhaps best demonstrated in the recent (September 2008) securing of £75k funding for advancing joint teacher continuing professional development (CPD) activities between DSC and Satrosphere. The involvement has provided a significant test to my management and leadership skills and strengthened them as a direct result of the experience.

9.2 Benefits to my employer

Satrosphere continues to operate and the link between the two organisations will, over time, strengthen the performance of both. Satrosphere has benefited significantly from the input of DSC over the last year and will move from a position of making annual trading losses of over £200k a year (2005 and 2006) to a breakeven position by the end of 2008/09. In addition to this major benefit to the wider Scottish Science Centres Network, of securing the future of one of the network partners, there are number of further benefits from securing an involvement in advancing this project:

- The securing of a management fee for DSC for it's support of Satrosphere, now directly financed by Satrosphere itself, has provided further financial stability to DSC. This has given Directors the confidence to commit the executive team to the pursuit of new projects. These commitments extend to further advancing the Science Learning Centre project, which will feature under project two of this annex to my thesis;

- The location of both centres in the East of Scotland has seen the early appearance of wider collaborative opportunities. An early example of this is DSC's work with Aberdeen University in advancing a successful funding application that will see DSC and Satrosphere working with the University to develop the CPD initiative highlighted in section 8.1;
- The commitment made by DSC to Satrosphere, in spite of the many risks to DSC in doing so, has demonstrated DSC's commitment to the Scottish Government to delivering sound management and good value in return for continued public funding.

Collectively these benefits to both DSC and Satrosphere are considerable and importantly highlight very early markers of what might be possible during the course of a longer relationship.

9.3 The main learning outcomes I have met

The main learning outcomes that have arisen as a result of my involvement in this project have been varied and fluid. Principal learning outcomes have been around managing major organisational change and crisis management. The corollary lessons associated with these areas are numerous and placed a variety of demands on me and those working with me in efforts to affect positive change.

The major challenge to my personal skills has been the further development of my leadership capability. Specific tests to my leadership and management skills during my period of involvement with Satrosphere have included changing organisational behaviour, wider change management, strategic planning, human resource management, financial management, implementing new systems and procedures and reflective practice.

The structure of the new business plan I produced for Satrosphere in late 2007 (see appendix 4) demonstrates an anticipated development path for Satrosphere from further organisational change (year one focus), to consolidation of these changes (year

two focus) to organisational growth (year three focus). The period of change while I have been Chief Executive of Satrosphere has been so rapid that the early shoots of organisational growth are already appearing in year one of the strategy. While very positive this growth will be carefully managed so as not to undermine the further change and consolidation that will remain the priority for Satrosphere for the foreseeable future.

The emphasis on change management in working with Satrosphere is a further link to the work contained in my doctoral thesis with its own emphasis on affecting major organisational change. That both change projects had performance management and accountability at their core provided a deeper and richer learning experience.

10.0 RE-IDENTIFYING THE PROBLEMS THAT HAVE BEEN ADDRESSED

The salient problems encountered in advancing Satrosphere's position have included:

- Identifying the basis and extent of financial difficulty at Satrosphere Science Centre;
- Prioritising issues for address and mobilising finite resources;
- Identifying and resolving operational and human resource related issues;
- Identify new resource from DSC and others, notably the Scottish Government, in tackling resource dependent issues;
- Stakeholder engagement and relationship building;
- Making improvements in, and having sufficient management of, information systems to be able to regularly monitor performance;
- Implementing a restructuring within both organisations in efforts to move both organisations to a stronger trading position.

All have been advanced to a point of safeguarding the short to medium term future of this important resource.

11.0 THE RISK PROFILE ASSOCIATED WITH THIS PROJECT

The nature of this project has been such that during my early phases of involvement with Satrosphere the associated risk profile was a significant one. In addition to the

many benefits delivered to Satrosphere, through both my own and the wider DSC teams involvement, a great many risks have also been taken on, some of which were uncharted before assuming an organisational responsibility for the centre. The major risk to my own involvement have been:

- Implementing a correction strategy that could have failed due to the fragility of the centre on arrival;
- Not fully auditing the potential for reputational damage both to me personally and DSC;
- The potential for seriously disrupting my professional doctorate at a critical stage in its development;
- Agreeing to get involved very quickly beyond my initial review having very possibly not identified all of the risks/issues facing Satrosphere during my short business review;
- Introducing significant distraction to a small team in Dundee that could have had a detrimental effect on the performance of DSC;
- The wider impact of asking an already stretched management team in Dundee to assume additional responsibilities and workload for an extended period of time.

These shortfalls in my own evaluation of the situation could have carried very significant consequences and were overlooked because of the urgency of the situation and my inexperience of handling this type of unusual situation. If faced with similar circumstances again I would endeavour to build sufficient time into the early assessment phase during which to develop a risk strategy.

12.0 PLANS FOR PROGRESSING SHORT/MEDIUM TERM CAREER DEVELOPMENT

My career will go through a number of milestones during the course of the next year, these include:

- Successfully completing the professional doctorate programme (March 2009);
- Producing a minimum of two academic papers from my doctoral thesis (September 2009);
- Completing my participation in the Noyce leadership programme (February 2009);

- Completing the consolidation of my external organisational commitments (November 2008).

Additionally, having now secured a minimum two year extension to my involvement in Satrosphere there are many changes which still require to be made in completing the organisational turnaround.

Having been Chief Executive of DSC for seven years my emphasis beyond fulfilling existing commitments will be to consider new employment opportunities, potentially overseas. The nature of the international science centre sector is such that my recent experiences, plus completing my professional doctorate, will give me a currency shared by relatively few other science centre Chief Executives.

PROJECT TWO

SCIENCE LEARNING CENTRE

PART ONE – DEFINING THE PROJECT, ITS LINKS WITH MY ACADEMIC WORK, EARLY INTERVENTION AND SKILL AND RESOURCE REQUIREMENTS

1.0	LINKING PROJECT TWO WITH MY ACADEMIC RESEARCH	2-2
2.0	DEFINING THE NATURE OF THE PROJECT BEING UNDERTAKEN	2-2
3.0	THE PERSONAL SKILLS I REQUIRED IN ORDER TO TACKLE THE PROJECT	2-4
4.0	AN EARLY CHALLENGE	2-5
	4.1 Organisational resourcing requirements	2-6
5.0	SKILLS ENHANCEMENT AND PERSONAL DEVELOPMENT	2-7
	5.1 The Noyce Leadership Institute	2-7
	5.2 Future development needs	2-8
6.0	THE CONTRIBUTION OF WORKING ON THE SCIENCE LEARNING CENTRE PROJECT IN ADVANCING MY ACADEMIC DEVELOPMENT	2-9
	6.1 The contribution of my doctoral research in advancing the Science Learning Centre project	2-10

PART TWO – SELF REFLECTION EXERCISE

7.0	AREAS OF STRONG PERFORMANCE	2-11
	7.1 Benefits to my professional and academic development	2-11
	7.2 Benefits to my employer	2-12
	7.3 The main learning outcomes I have met	2-12

PROJECT TWO

SCIENCE LEARNING CENTRE

PART ONE – DEFINING THE PROJECT, ITS LINKS WITH MY ACADEMIC WORK, EARLY INTERVENTION AND SKILL AND RESOURCE REQUIREMENTS

1.0 LINKING PROJECT TWO WITH MY ACADEMIC RESEARCH

My second project was initiated around the time of starting my professional doctorate programme. Unlike the performance management parallels of my first project, Satrosphere, my second example has always been focussed on public engagement with science (PES) and advancing the CPD of Scotland's teaching professionals. In this regard both projects cover the two major areas of focus of my thesis.

With initial interest having been established by an independent review of Science Learning Centres (SLCs), commissioned by the Scottish Government, much of this projects early focus was on creating a new facility rather than the nature, content, range and effectiveness of programmes and activities that would ultimately determine its success. The development of my understanding around PES gained through advancing my thesis allowed me to bring this critical part of the project back into sharp focus and specifically led to the development of an internationally emphasis around advancing PES research. This aspect of my SLC project has the potential to help answer several of the questions around science centre impacts left by my main investigation.

2.0 DEFINING THE NATURE OF THE PROJECT BEING UNDERTAKEN

In 2005 the Scottish Executive commissioned a study to determine the scope for co-locating Science Learning Centres (SLCs) within each of the four Scottish science

centres (see appendix 5). Prior to this investigation eleven regional SLCs had been created in England and established with funds from the Wellcome Trust and Department for Education and Skills (DfES). The network has a national centre based in York. These centres deliver a range of science, technician and leadership and management-based CPD programmes and as such provide an important professional development resource for teaching professionals and technicians.

To date only a handful of Scottish teachers have attended CPD at the National SLC due to the difficulty in getting to York and the differences in curriculum between Scotland and England. The absence of such centres in Scotland, coupled with the Scottish Executives existing commitment to provide public funding to the four Scottish science centres led to the commissioning of this study by the government.

A copy of the DSC section of the Government's report (see appendix 6) highlighted both the scope and importantly appetite within DSC to advance the development of an SLC. The availability of a footprint of land adjacent to the science centre also provided the scope with which to develop a new-build resource of potentially national significance.

Following the publishing of the SLC investigation the DSC team bid for Scottish Executive funds in efforts to further establish the feasibility of developing an SLC in Dundee. A copy of the original funding proposal is attached under appendix seven and highlights the early ambition of the Dundee team. On successfully securing funding the Dundee team delivered a feasibility study which supported its ambitions for developing a new resource of at least regional, if not national importance. The completion of this investigation took eighteen months and determined the scope of the

facility, a detailed costing of the capital project and concept images of how the new facility might look.

While this investigation took place a small team within the centre, led by me, undertook extensive stakeholder meetings in efforts to secure early advocacy for the project. These meetings highlighted a need to move beyond a single focus on teacher CPD to one which also encompassed a public engagement with science (PES), science learning and research agenda. At this stage of development the project eclipsed the scope of the English SLCs and was subsequently termed the *Scottish STEM Centre* in accounting for what has become a broader science, technology, engineering and maths (STEM) focus. A progress report that highlights the development in the project is recorded under appendix eight.

3.0 THE PERSONAL SKILLS I REQUIRED IN ORDER TO ADVANCE THE PROJECT

With a background in running commercial visitor attractions my first few years in Dundee were almost entirely focussed on stabilising a business that had experienced very early decline. DSC is one of the UK's millennium projects and along with a number of other millennium projects failed to achieve early visitor and financial targets. Since my arrival in late 2001 the centre has steadily grown and secured over £4m in capital funding, almost all of this secured on a competitive basis. This funding has fuelled the renewal of over eighty percent of the centres exhibitions and a reconfiguring of the exhibition space which has maximised the space available for public exhibitions.

The consecutive business plans I have written for DSC express growing ambitions for the centre around widening audience, the effectiveness with which the science centre

engages its visiting public and the importance of the role of the science centre in the regional community. The work undertaken in delivering these plans has advanced DSC to a stage where a new, broader, focus on STEM and the engagement of a wider stakeholder group is a natural and timely development.

4.0 AN EARLY CHALLENGE

The early feasibility work sought to establish the scope for creating a new resource, of potentially national significance. The early emphasis on creating a new facility threatened to overshadow the initial reason for seeking to advance this project i.e. to help overcome the fear of teaching science that many primary teachers have and to equip them with the skills needed in order to better engage children with science-based learning in the classroom.

The early work associated with this project delivered a conceptual, building but one seemingly more interested in delivering an iconic structure with an underlying sustainable business model, than a vessel for delivering a significant impact on teacher CPD.

The early emphasis on any new resource being financially sustainable was influenced by the experience of the English SLC model in which all of the centres remain fully dependent on the grant support of the Wellcome Trust and central government. The consideration of how to overcome these sustainability issues identified a need, in Dundee, for new commercial conferencing facilities for the City. An independently commissioned study of conferencing business in Dundee identified that the City is currently missing out on annual bookings of academic conferencing alone of up to £1.5m a year. While Dundee has a number of conferencing venues there is a current

shortfall in facilities that will accommodate up to 400 delegates and the early STEM Centre model has been based on developing a facility of this capacity. This commercial opportunity has driven much of the nature and scale of facility that is being considered and has the potential to underpin much of the cost of delivering high quality teacher CPD.

As both the scale and ambition for the new centre has grown it has become significantly more complex and in all likelihood more difficult to secure funding for. In this regard much of the reflective practice which has gone on in recent months has been based on regaining a focus on advancing DSC's CPD credentials – in the existing science centre building, and securing a small amount of working capital in order to pull together a project team who will advance the wider project over the course of the next twelve months.

4.1 Organisational resourcing requirements

A major challenge for the development of my project has been the scarcity of resources within DSC. This has effectively led to the two senior, executive, members of the management team trying to advance the development of this major project by themselves. As one of the members of this small team I have been frustrated by the lack of progress and to this end recently identified the need for a restructuring of the executive team and non-executive Board of Directors that would assist in bringing a necessary focus to the project.

I shared my views with non-Executive Directors at their August 2008 meeting and they subsequently agreed to the establishment of a new tier of executive Directorship, accompanied by the creation of two new committees within the Board. These

committees will focus on the development of the capital project and the development of public engagement and science learning based activities that will eventually move across to the new facility.

These structural changes are currently being implemented and importantly demonstrate full organisational commitment to advancing this important project.

5.0 SKILLS ENHANCEMENT AND PERSONAL DEVELOPMENT

Having taken the lead in this project for over two years my skills have already been enhanced. In addition to personal skills development my direct involvement in the project has also significantly widened my business network. Major stakeholders I have presented the project to include:

- Scotland's former First Minister, Jack McConnell;
- Chief Scientific Advisor for Scotland, Professor Ann Glover;
- Professor Sir Philip Cohen, University of Dundee;
- Professor Sir Alan Langlands, Principal, University of Dundee;
- Local Members of the Scottish Parliament (MSPs).

To date I have met with over fifty other organisations locally, regionally and nationally in efforts to win a wide base of support for the project. Further meetings are currently being held with those organisations that will likely make a direct contribution to the further advancement of the STEM project.

5.1 The Noyce Leadership Institute

In addition to skills developed while managing the project perhaps the major boost to my personal development has been my participation in the inaugural fellowship of the Noyce Leadership Institute. This leadership programme, for science centre Chief Executives created by the US-based Noyce Foundation, is importantly tailored to

supporting those attending in advancing a strategic initiative of important to their own institution.

Now (October 2008) over half way through the nine month programme I have chosen to focus my development around advancing my STEM Centre project. The support offered by the programme comes in many forms and includes regular fellowship meetings supported by a faculty of senior science centre professionals and others from the not-for-profit and academic world, monthly participation in peer learning groups and the use of individually focussed management coaches. The opportunity for personal development through participating in the Noyce Fellowship has been a very significant one and I hope to have secured the necessary working capital for my project by the conclusion of the programme in February 2009.

In addition to participating in the Noyce Fellowship I have also recently been reducing the number of external commitments on my time. While having not directly impacted on my personal development the decision to work towards a more focussed approach has been an important one for me as I have a tendency to over-commit myself. Having stepped away from three external Board appointments in November 2008 I recognise this as part of my preparation for a more focussed approach to advancing my project from the very beginning of 2009.

5.2 Future development needs

As my leadership skills have developed I have come to terms with the fact that where I have development needs I do need to address them but also that others in my team typically have complimentary skills that do make a significant difference when utilised.

As a function of my participation on the Noyce Leadership Institute programme I have undergone personality profiling and employed a 360 degree review, a process whereby bosses, colleagues, direct reports, peers and customers provided feedback on my leadership and management capability. The key issues that emerged from this review were around life/work balance, time management and a need to be more 'present' for members of my management team. The similarity of these issues is telling in re-enforcing the need for me to rationalise my work-based commitments and invest more time in supporting the development of the senior members of my management team. I am currently working to address this issue as evidenced by my earlier reporting of stepping down from a number of external commitments and the restructuring of my team. Changes to the executive structure include the appointment of an Executive Assistant, a function that will significantly reduce the administrative burden on my time.

6.0 THE CONTRIBUTION OF WORKING ON THE SCIENCE LEARNING CENTRE PROJECT IN ADVANCING MY ACADEMIC DEVELOPMENT

The SLC project appeared around the time I started my professional doctorate programme. The opportunity afforded by having both pieces of work develop concurrently is that my interest in how to better engage a visiting public with a science agenda has grown as a direct result. The major benefit to my academic development of being involved in the STEM project is in how the new centre begins tackling a research agenda around PES. While this agenda has yet to be pursued my direct involvement in driving this forward will greatly influence my future academic development.

6.1 The contribution of my doctoral research in advancing the Science Learning Centre project

While the likely benefits of my involvement in the STEM Centre project are ahead of me my period of study has already informed my approach to developing the SLC and directly contributed to the emphasis on developing the new research agenda alluded to above. The scale of research opportunity identified by my period of study is such that I have already engaged the University of Dundee in discussions over how both organisations might secure funding to create a new Chair for PES and Science Learning. The intention is that this post holder, supported by a small group of researchers, will begin tackling the many questions around how to more effectively engage the public with a PES agenda. For my own part I have already been given approval by my Board to recruit a new research post for DSC, the first for the centre and one of the first posts of its kind in the UK.

PART TWO – SELF REFLECTION EXERCISE

7.0 AREAS OF STRONG PERFORMANCE

The idea of developing a new teacher training facility in Dundee, of at least regional importance, developed out of a small independent study commissioned by the Scottish Executive in 2005. The output from this initial investigation could have easily been lost had it not been for my early discussions with the Scottish Executive which led to DSC securing £65k with which to advance a feasibility study.

The outputs of the feasibility study have led to further development and the recent agreement of the DSC Board to undergo a major restructuring within both non-executive and executive structures of the organisation. I have led the instigation of these changes, which will support the continuing pursuit of this project into the project initiation phase of development.

7.1 Benefits to my professional and academic development

Having been employed by a small science centre for seven years, the opportunity afforded by pursuing a project of potentially national importance is a highly significant one. The recent need to make structural changes within the organisation has provided a further learning curve that has equipped me with a further skill set that will likely aid me further in both current and future employment but also in any future non-executive roles I may be appointed to.

My academic development has been significantly advanced by me undertaking a professional doctorate. This has been of influence in the early development of the SLC project and expansion into a wider STEM orientated project.

7.2 Benefits to my employer

The recent structural changes approved by the DSC Board will, critically, strengthen the organisation and give realistic hope to further advancing the STEM Centre project. If able to advance this project through to realisation it will significantly diversify the work of the science centre, strengthen its position as a key local resource and lift its outputs to a level where it is consistently demonstrating good and best practice. Having only briefly touched on the potential for advancing an important research agenda, this work alone could raise the profile of DSC to an international one.

The benefit to my employer of the work carried out to date is that it has explored a further avenue of development, of strategic importance, and which could provide a basis for long-term intellectual and financial sustainability. This work has also asked critical questions around the historic effectiveness of non-executive and executive Board functions and has led to changes here which, in themselves, will benefit the organisation long-term.

7.3 The main learning outcomes I have met

The pursuit of this major project has contributed to my learning on a number of levels. Having initially identified a potentially significant opportunity and secured the funding necessary in order to advance a feasibility study, the project did lose its way for a period time. This was due to the feasibility study focussing predominantly on the structural aspects of the project. This threatened to see the development of a ‘white elephant’, a beautiful building but with little content or academic output. Fortunately this distraction was identified at sufficiently early a stage as to bring much greater emphasis to the educational potential of the proposed new resource. This emphasis, timely in its appearance at a maturing science centre, will lead to future enhancements

of DSC's core outputs even if the wider, new-build, project does not materialise. The downturn in both the UK and international economy does not bode well for advancing major capital projects and so the recent emphasis on PES and education outputs has proven to be a sound decision.

Currently on the verge of entering into a new phase of the projects development, the fundraising drive, it is important that an emphasis on educational developments is maintained. This next phase of the projects advancement promises further learning opportunities.

APPENDIX 1

OFFER OF OPERATIONAL GRANT INSTALMENT

original, signed by EHM 24/8/77



SCOTTISH EXECUTIVE

Office of the Chief Scientific Adviser

Mr Hugh Morel
Chair
Satrosphere Science Centre
The Tramsheds
179 Constitution Street
ABERDEEN
AB24 5TU

Office of the Chief Scientific Adviser

St Andrew's House
Regent Road
Edinburgh EH1 3DG

Telephone: 0131-244-2401
ScienceEngagement@scotland.gsi.gov.uk
<http://www.scotland.gov.uk/science>

24 August 2007

Dear Hugh

SATROSPHERE SCIENCE CENTRE OFFER OF OPERATIONAL GRANT INSTALMENT

Following our meeting with you, Graham Shanks, Ros Birch and Michael Reid at Satrosphere on 20 August, I am writing to advise you that the Scottish Executive is prepared to make a further grant to Satrosphere of £10,000. This is in recognition of your urgent financial needs, but also reflects that Satrosphere has not fully complied with the conditions set out in my letter to you of 20 June 2007 and my e-mail to you of 10 August 2007.

Our offer is subject to the following understanding and conditions.

1. This represents a further payment from Quarter 2 (July – September 2007) of your operational grant, and reflects the figures quoted in John Simpson's recent review of the Satrosphere Financial Plan 2007.
2. This is a one-off, goodwill payment to enable Satrosphere to pay its August wage bill and remain trading into September 2007, at which time the position of other funders (notably Aberdeen City Council, the University of Aberdeen and The Robert Gordon University) will be known and a review of emergent options can then be undertaken.
3. You engage Paul Jennings (Chief Executive of Sensation Science Centre, Dundee) with immediate effect to undertake a whole-business review of Satrosphere and produce a forward-looking sustainable business and financial plan, according to the scope of the study you outlined in your e-mail to Paul Jennings on 23 August 2007. We expect this business and financial plan to address all aspects of Satrosphere's business, including financial, operational, marketing and people/management (including composition of the Board and Executive).
4. You invite HMIE to work alongside Paul Jennings in progressing the business and financial plan at paragraph 3, as offered in my letter to you of 24 July 2007.



hugemorel 24/8/77

5. The Scottish Executive will consider no further payments from your operational grant (either in September 2007 or beyond) until we have had the opportunity to consider the business and financial plan at paragraph 3, and it has been fully approved and accepted by Satrosphere's Board. In your e-mail to Paul Jennings on 23 August 2007, you suggest a 3 week timeframe for production of the business and financial plan at paragraph 3, and we would agree that this is a realistic and necessary proposition.
6. All remaining outstanding conditions set out in my letter to you of 20 June 2007 remain in force, including repayment of mis-directed programme grant in relation to the Energy Futures Zone.

While this offer remains open for acceptance until one month from the date of this letter, we recognise the urgency of Satrosphere's situation, and will endeavour to process payment of the grant as soon as this offer is accepted by an Executive Director or authorised signatory of the Company, by signing and dating the acceptance form on page 3 on behalf of the Company and returning this to me at the above address. In so doing, the Company agrees to all the terms and conditions set out in this letter and the Grant Offer letter of 29 March 2007 and its attached schedule.

To enable us to process payment we would need to receive a signed copy by return e-mail by 3pm, today Friday 24 August 2007.

I look forward to hearing from you in the very near future.

Yours sincerely

Ben Dipper

PP DR ISABEL BRUCE
On behalf of the Scottish Ministers

By e-mail

Cc: Graham Shanks Chief Executive of Satrosphere Science Centre
Professor Anne Glover Chief Scientific Adviser for Scotland

Keep Model 24/8/7

ACCEPTANCE OF OFFER

Satrosphere Ltd. accepts the terms and conditions set out in the Scottish Ministers' offer letter dated 24 August 2007.

Signed: Hugh Morel Date: 24 August 2007, 3pm

Name (block capitals): EDWARD HUGH MOREL

Director and authorised signatory for and on behalf of Satrosphere Ltd.

APPENDIX 2

INVITE TO CONDUCT BUSINESS REVIEW

Paul Jennings

From: Hugh Morel [edward.morel@freeuk.com]
Sent: 23 August 2007 22:31
To: Hugh Morel; Graham J. Shanks; Michael Reid; Peter Robertson; lesleyglasser@btinternet.com; jastewart@aberdeencity.gov.uk; Dominic Houlihan; cllr.m.j.d.sullivan@aberdeenshire.gov.uk; admilne@aberdeencity.gov.uk; Colin C Caldow; Paul Jennings
Cc: Morel Hugh (Hotmail); Ros Birch; Isabel.bruce@scotland.gsi.gov.uk
Subject: 070823 Satrosphere's Future: Review by Paul Jennings of Sensation and Jack Jackson of HMle

23 August 2007

For the attention of Paul Jennings, CEO, Sensation
Copy Satrosphere Board, Ros Birch
Copy Dr Isabel Bruce, Scottish Executive

Paul,

I am very grateful to you and your Chairman, David Sigsmith, for you making time to assist Satrosphere at this time.

Following our conversation this evening I confirm that Satrosphere Board would like you to conduct a review of Satrosphere. The proposed scope is described in my e-mail to the Satrosphere Board. I have had comments from several Board members on this, each of which has made positive suggestions in somewhat different directions, so I've decided to leave my e-mail to them unchanged. It is attached. I would like you to let me know if you think my proposed plan for the review is sensible and appropriate, and do suggest changes if you feel they are needed.

We have already accepted Dr Isabel Bruce's offer of some consultancy time from Jack Jackson, recently retired from HMle and one of the authors of the recent HMle report on the Scottish Science Centres' Network. I will contact him tomorrow. I am sure that you and him combined will be most helpful.

As I mention in my e-mail to the Board, we do need to move swiftly, and I would be most grateful if you could liase with Graham as to starting. If you can both start on Monday that would be excellent.

This will be a hard time for Ros and Graham, but they are both acutely aware of the importance of this review which I hope will not be too intrusive of them. However, I'm sure they will provide all assistance you require in providing information and access to Satrosphere people.

Clearly not all of the topics listed in the scope can be addressed immediately, but the main urgency is to get your views on the financial and people sides of the organisation in good time in September, as I would like you to present your findings (together with a written interim report) to Satrosphere's Board about three weeks from now, so we can respond to Dr Bruce in sufficient time for her to be able to act before the end of September. I am particularly keen for you to consider the financial implications of different modes of running Satrosphere, including with current opening hours, managed shutdown or restricted opening, and different management and fundraising arrangements. Later on equally important matters, such as the science content, interaction with schools etc, can be addressed.

As we discussed I think it would be an excellent idea for you to speak to everyone involved in Satrosphere, staff and Board. Unless I hear to the contrary I would think the best way to contact non-executive Board members would be by e-mail, as they are copied on this e-mail.

I know of your Chairman, David Sigsmith's support for you helping us (and I'd appreciate you forwarding this e-mail to him), and I hope that we will continue to have closer and closer co-operation with Sensation (and the rest of the Scottish Science Centres Network).

It is clear we need significant change at Satrosphere, and I hope your assistance will help us effect that change.

Sincerely

Hugh Morel
Chairman Satrosphere

16/09/2008

APPENDIX 3

WHOLE BUSINESS REVIEW – SATROSPHERE SCIENCE CENTRE

Whole Business Review Satrosphere Science Centre

**Presented to the Board of Satrosphere Science Centre
10 September 2007**

Paul Jennings
CEO
Dundee Science Centre

Whole Business Review – Satrosphere Science Centre

Contents

	Page.
1.0 Executive Summary	3
2.0 Background / Context	5
2.1 Approach	6
2.2 Limitations of review	6
3.0 Finance	7
4.0 Staffing and Board of Directors	9
5.0 Operations	12
6.0 Education	13
7.0 Stakeholder Engagement	14
8.0 Next Steps	14
Appendix 1 - Recommendations	16
a. Finance	16
b. Management	18
c. Efficiency and Effectiveness	20
Appendix 2 - Revised Profit and Loss Account	

1.0 Executive Summary

This report pulls together the major findings and associated recommendations of an intensive business review on Satrosphere Science Centre in Aberdeen, conducted during week commencing the 3rd September. The focussed nature of this review has been dictated by the current poor financial health of the organisation, which threatens the continued operation of the centre.

The review has identified a number (29) of recommendations for consideration by the Satrosphere Board and in turn its major funding partners. These recommendations follow the body of this report (Appendix 1.) and efforts having been taken to weigh them in order of importance to the organisation. While the reach of individual recommendations is finite their collective implementation would aid redress of the key issues currently facing Satrosphere and allow for some optimism about a positive and sustainable future.

The major issues facing Satrosphere are governance related and fall into three categories: *Finance, Management and Efficiency & Effectiveness*. The early address of the first of these is critical if recommendations around management and efficiency and effectiveness are to be progressed. Equally, changes to the management of Satrosphere are also required if the centre is to become more efficient and effective, both in terms of its commercial operation and education based aspirations.

The urgency of Satrosphere's situation is such that much of the focus of this review has been on maintaining solvency, strengthening the centre's financial management and reporting and developing suitable governance structures which allow the centre to move forward on a more professional footing. For these reasons further scope exists for more fully considering efficiency measures and effectiveness. This and other areas for future focus are identified at the end of the report.

In financial terms, Satrosphere is on the verge of overextending itself and Directors should give serious consideration to closing the centre if additional funding cannot be secured in the immediate future.

Even if early financial support is secured, there still remains a need to considerably reduce Satrosphere's cost base, if the organisation is to remain within its overdraft limit by the financial year-end. Based on its size and the scale of savings required the only area where Satrosphere will realise major cost savings is in its payroll. A much slimmer structure with reduced (executive) management capacity and almost no administrative staff would initially see a much weaker but solvent Satrosphere. The major reduction in overheads proposed in this review would also allow the centre to begin thinking about how it repays a £72k loan from the Scottish Government but subject to a successful re-negotiation of repayment timescales.

Satrosphere's non-executive Directors must get more involved in setting strategy, agreeing plans, and seeing operations remain on track. An additional option of involving a similar organisation, Sensation in Dundee, also exists. This could be on a management contract basis and has the potential to bring many benefits (including efficiency and effectiveness) but importantly requires further consideration and approval by others, notably the Satrosphere Board, Sensation Board and those

Whole Business Review – Satrosphere Science Centre

organisations who provide major funding. Beyond a period of stabilisation, significant potential and benefit could lie in a closer organisational alignment between organisations and should be considered at an appropriate point.

Lastly, if both financial and management structures can be successfully changed to support a necessary different model for Satrosphere there will (in the medium-term) be scope for considering a growth model for Satrosphere that has both efficiency and effectiveness at its core.

The review of Satrosphere has identified a latent potential within the organisation that could see it become a major vehicle for science education and public engagement with science in the East of Scotland. The full commitment of Directors and the organisations major funders will be key to both tapping and fulfilling this potential.

2.0 Background / Context

As a condition of grant offer, the Scottish Government has requested this ‘whole-business review of Satrosphere’. In return Satrosphere received a grant of £10,000 in order to allow it to continue to operate while the review took place. The Scottish Government has stated that it will consider providing further release of its operational grant to Satrosphere once it has had an opportunity to consider the enclosed review and it has been fully approved and accepted by Satrosphere’s Board. The approval and release of longer-term funding by the Scottish Government will be dependent on any outstanding conditions set out in previous correspondence being met. These include the repayment of £72k of programme grant, intended for an Energy Future’s Zone. A timescale for repayment of this sum by 31st March 2008 has been indicated.

The Scottish Government has additionally requested that the business review consider a forward-looking sustainable business and financial plan, one that addresses the scope provided by Satrosphere Chairman, Hugh Morel. Dr. Morel asked that consideration be given to:

“the financial implications of different modes of running Satrosphere, including with current opening hours, managed shutdown or restricted opening, and different management and fundraising arrangements. Later on equally important matters, such as science content, interaction with schools etc, can be addressed.”

Specific areas identified by Dr Morel included:

- Finance – current and future financial situation under different funding scenarios, financial controls including better accounting software, cost controls, revenue maximisation;
- Operations – Exhibition presentation, educational and scientific content, interaction with schools, retail and café, outreach;
- Staffing (to include composition of the Board) – staffing requirements for different future modes of operation, including managed closure, reduced delivery, current opening and delivery;
- Marketing – areas for marketing, budget for marketing;
- Stakeholder engagement – interaction with local organisations (public and private sector)

The Scottish Government’s grant offer letter also requested that HMIE be invited to attend and contribute towards the review. Dr. Morel contacted Professor Jack Jackson of HMIE who declined to participate on grounds that he felt this would be a conflict of interest. Professor Jackson suggested an alternative, local, contact (Jackie Heaton) and this has been followed up.

The timescales for producing this report have been such that any substantial emphasis on education activities and outputs will have to take place at a later date and initially subject to this business review being acceptable to the Board, Scottish Government and potentially other funding partners.

2.1 Approach

The review was carried out during week commencing the 3rd September. During this time key strategic documents, information related to the finances of the operation and various correspondence related to the current situation were provided. This is a fitting early point in the report to thank Dr. Hugh Morel (Chairman), Graham Shanks (CEO) and Dr. Ros Birch (Operations and Education Manager) for their full co-operation in providing all information requested and in a timely fashion.

In addition to desk based research there was also an opportunity to conduct interviews with many of the salaried members of staff, including the management team, which comprises Graham Shanks and Dr Ros Birch. I also met with several members of the non-executive Board and found this combination of approaches most useful in efforts to identify clear options and where appropriate recommendations for the Board to consider.

2.2 Limitations of review

The review was conducted in a limited timeframe in order to meet the critical operational / financial needs of the centre. In its current financial position Satrosphere would be unable to pay staff salaries at the end of September. Despite this impending issue I have had the sense, throughout my review that both the executive Director and members of the non-executive board are committed to the process and keen to consider all options in their efforts to secure a future for Satrosphere science centre.

The limited time available will not allow all options identified e.g. managed closure, to be fully investigated in terms of process, consequence, resource implications, etc. For this reason only two identified (operational) approaches will be explored more fully. If the Scottish Government finds it is unable to support either approach then Directors should initiate managed closure at the earliest opportunity.

While I have endeavoured to speak to as many of the major stakeholders as possible it has not been possible to speak to all and early discussions with these parties, including both Aberdeen and Aberdeenshire Council are encouraged in the early days after the reviews findings are presented to Directors.

A longer period of review would be desirable in efforts to realise the sustainable operational and financial plan, which the Scottish Government have requested. In this regard this review has emphasised areas of priority and the actions that will be required in order to continue to operate in the immediate (end of September 2007), and short (March 2008) term.

3.0 Finance

The critical state of Satrosphere's finances has directly brought about the need for this business review. Having attended Satrosphere's last Board meeting (31st August) it quickly became apparent that the organisation is very close to overextending itself with discussions about whether in fact the organisation was currently still trading solvently. The qualified opinion of Director and chartered accountant, Michael Reid, was that the centre was solvent at that time but that immediate corrective action was necessary in order to avoid insolvent trading, a position which all Directors were united in wanting to avoid.

Satrosphere has an overdraft facility of £147k, guaranteed by Aberdeen City Council, and had a balance of -£132k as of 31st August. Draft accounts for 2006/07 suggest this agreement expired in May 2007. Satrosphere's CEO has verbally confirmed that this agreement has been renewed.

While outwith the scope of this study it was also mentioned (at the Board meeting) that Satrosphere's Auditors had been asked to step down until such time as it was clear that the organisation was in a position to continue trading. Pending a funding decision auditors will need re-appointing in efforts to ensure 2006/07 accounts are signed off and lodged with Companies House in advance of the necessary deadline.

Satrosphere's current financial position is made quite considerably worse by the presence of aged creditors, many now over 90 days old, with a total value of approximately £30k. In this situation the majority of creditors are only being paid at the point of threatening to halt their supply of the centre. This situation poses some considerable reputational threat to the future commercial trade of the centre and should be addressed at the earliest opportunity.

This will essentially wipe out all benefit of the £20k now offered by Aberdeen City Council in lieu of school visits that took place earlier this year. The release of this £20k is subject to a satisfactory report on these visits being received and I believe that the CEO has this in hand. Acceptance of a further £10k offer by Aberdeen City Council will be subject to current discussions and the ability of Satrosphere to continue to offer school visits.

Maintaining short-term liquidity of the centre is a major priority identified in this review and heavily influences the available options, which Directors asked to be presented with. The first option for Directors to consider, and in all likelihood triggered by a Scottish Executive decision to discontinue its funding of Satrosphere, would be for Directors to take an early decision to cease its trading activities. The critical nature of Satrosphere's finances is such that there would be little time for alternative, major, funders to be identified and secured. While this option (**Option 1**) will not be explored further in this review it may need to be discussed by Directors as a matter of urgency following Scottish Executive and other funder decisions about funding in the short-term.

The relative absence of historic financial reporting to the Board, notably in the form of monthly management accounts, has not helped matters and should be implemented in time for the next Board meeting.

This process has not been made any easier by the relatively unsophisticated accounting software (QuickBooks) employed by Satrosphere. The key issues associated with current software are around both the quality and quantity of financial information generated and perhaps more importantly the timeliness in which the system allows this to be produced. Currently, accurate financial performance is not known for several weeks after each month end. This is of major importance in making effective management decisions.

This review has not been afforded the time to consider individual accounting packages that might be suitable for an organisation of Satrosphere's size albeit two Directors have suggested a move to Sage.

Satrosphere's financial health is currently such that even if Scottish Government funding were to continue, major cuts, additional funding, or a combination of both would still be required. In the absence of any current commitment from non-Scottish Government funders a major rethink of Satrosphere's operating base has had to be considered. In essence the current financial model is wholly unsustainable and so no longer fit-for-purpose.

A review of Satrosphere's profit and loss account illustrates that the majority of overheads are relatively lean, with little room for further 'substantial' saving. As with all other science centres, Satrosphere's major cost is its payroll. For this reason significant staff cuts will have to be considered if a more financially sustainable model is to be realised.

Appendix 2. shows a revised profit and loss account for Satrosphere. This reflects actual performance for the first four months of the year and a forecast for the remaining eight. A forecast of visitor numbers has been made based on historic performance and trends in spend have been taken into account in efforts to reflect realistic levels of commercially generated, income over the next eight months.

Catering and retail gross profit margin has been fixed to reflect what performance should be achievable and care will need to be taken to monitor factors such as high wastage. One means of achieving this would be an early review of the catering offer in efforts to ensure staff prepping time, wastage, etc are kept to a minimum. In efforts to better monitor commercial performance monthly stock takes are also recommended.

While several scenarios have been considered in terms of winter closure, reduced opening hours, days, etc the most likely reality is that any savings in wages would likely be balanced against losses in commercial activity. For this reason restricted opening has not been considered further at this stage.

4.0 Staffing and Board of Directors

4.1 Non-Executive Board of Directors

During my review of Satrosphere I interviewed ten members of staff, a group selected from all departments. Employees consistently came across as both passionate about what they were doing and committed to the organisation. I also interviewed seven members of the Satrosphere Board and most of these on more than one occasion. In firstly addressing the Board it is quite clear that further effort is required in order to strengthen governance structures and communication both within the Boards ranks and with the executive team who operate Satrosphere on a day-to-day basis.

Communication must become more open and involving and based on my investigation I firmly believe that the Satrosphere Board must share responsibility for Satrosphere's current precarious financial position. The Board should have probed further and deeper and insisted on additional information from its executive. While it would be unfair to suggest the current situation could have been avoided had this happened, the issues would have likely presented themselves sooner and given scope for additional options to be explored. Sound governance and effective risk management appear to have been largely absent and further training for all Directors is suggested.

The current organisations represented at Board level are:

- Aberdeen City Council
- Aberdeenshire Council
- Aberdeen University
- Ithaca Energy
- Meston Reid & Co (Chartered Accountants)
- Robert Gordon University

Additionally, Dr Lesley Glasser (co-founder of Satrosphere) sits on the Board as an independent Director.

The Satrosphere Board is currently well served by local Councillors but would benefit considerably by securing 'officer' input and notably from both Council's education departments.

The University based Directors have potential to make significant contribution but this has not been historically utilised. If Satrosphere has ambitions to become a dynamic, engaging (public engagement) and contemporary showcase (knowledge transfer) for science then the input of the University representatives is critical. The presence of both Universities at the Satrosphere Board also has latent potential for developing the credibility of the centre, something that could quickly begin to change public perceptions of Satrosphere. Every effort should be made to tap this. The two University based Directors additionally bring a science skill base and are joined in this by Dr Lesley Glasser (Chemist) and Dr Hugh Morel (Engineering). These Director's do not appear to have been fully engaged in recent exhibition development and further input is to be encouraged but only as long as it does not inhibit the advancement of such developments.

Dr Morel is the current Chairman of Satrosphere and commissioned this review. Given the current position of the centre and the work that must now follow in safeguarding Satrosphere's future it is recommended that the Board consider whether Dr Morel is best suited to this task or whether a new Chair, potentially in an interim capacity, is now required. This statement is not intended to be critical of Dr Morel but reflects the need for a new style of leadership. Timing might actually suit an interim Chair for review at the year-end.

During my interviews with Directors there was some discussion about the timing of Board meetings. While at face value this may appear trivial, the current policy of holding meetings on a Friday evening is almost certainly contributing to low attendance levels. If Directors are jointly agreed that out-of-hours meetings are more suitable in not clashing with individual work commitments, then days other than Fridays and potentially early morning meetings (8am) should be considered.

The Satrosphere Board currently meets quarterly and this seems insufficient given the work that must take place between now and the end of the current financial year. A sub-committee, one with a governance, risk management and fiscal responsibility, which meets monthly and reports to the main Board at quarterly intervals, would bring a necessary commercial and operating focus that has, at least recently, been lacking. This committee would be well served by the skills of current Director and chartered accountant Michael Reid. This committee would be well served in securing the input of other business orientated non-executives who bring with them human resource, marketing and commercial experience, skills that are largely absent from the current Board composition.

4.2 Employees

When interviewing Satrosphere employees (other than management team) several consistent themes presented themselves:

- Communication from senior management (Graham and Ros) is typically poor;
- Satrosphere has distinctly different modes of operation between weekdays and weekends;
- Satrosphere has several departments (management, education, office, retail, catering) and several teams (as opposed to a one team approach);
- Some staff expressed concerns over recent funding decisions e.g. lighting rig that remains switched off because it is too expensive to have on, preparation work for alcohol license, etc;
- Several staff I spoke to were unclear of chains of command in the organisation and the roles and responsibilities of others.

These combine to provide quite significant confusion and directly influence a visitor experience that is at best inconsistent.

Historic mechanisms for communication, such as daily team briefing no longer exist and the awareness of financial problems in the organisation, coupled with not knowing what is being done to address these is having a serious effect on staff morale and motivation. This has been further exacerbated by the absence of staff appraisals this year.

Whole Business Review – Satrosphere Science Centre

Staff noted several other concerns but of these the fact that not all staff had current contracts of employment was a notable one.

The nature of review is such that in efforts to identify a sustainable way forward staff feature highly. In order to survive to the year end and be in a position to look toward 2008/09 with some confidence there is currently no other option than to make several members of the salaried team redundant. Failure to act quickly could see Satrosphere's position become unrecoverable if left for more than a short period of time, potentially the space of a week or so. As stated earlier the release of the Scottish Government's revenue grant, previously agreed, is only part of the solution.

Based on cash flow projections, a further c.£100k in savings requires to be made in the current financial year in order for Satrosphere to stay within its overdraft limits. Carrying these savings forward to 2008/09 should allow repayment of the Scottish Executive's £72k and a start to be made in reducing the centre's overdraft facility. Paying off the overdraft should be a longer-term goal, which Directors work towards. Directors should also familiarise themselves with new charity regulations and specifically recent changes to 'reserves' policies.

In considering staff redundancies care has been taken to ensure both education and commercial aspects of the centre remain largely in tact in order that they might continue to serve visitors with an education / public engagement based service but one which also retains much of its income generating capacity. In order to retain these elements there is a requirement to consider the continuation of all other roles and notably those associated with senior management and support functions e.g. technicians, IT support, admin and business development. The level of redundancies must be driven by the critical nature of finances and in this regard it is proposed that the following positions be considered for redundancy with effect from 1st October 2007:

- Chief Executive Officer
- Operations & Education Manager
- IT Officer
- Technical Manager
- Technical technician
- Development Director
- Admin Officer

The cost of making these redundancies has been calculated and entered into the revised profit and loss account for the year (appendix 2.). Directors should seek professional advice in confirming these costs. It is also advised that Directors seek professional support in conducting the necessary redundancy process, including the earliest discussions with those members of staff who will be affected.

In addition to salaried positions Satrosphere also currently contracts an external consultant for its marketing activity. This has historically emphasised a mix of print, event and PR based marketing. In the short-term any marketing activity should be brought in house and this contract terminated with effect from the 1st October. Provision for some marketing has been retained in the revised profit and loss account.

Whole Business Review – Satrosphere Science Centre

The remaining structure is very delivery focussed and requires minimum changes. It is proposed that the current Commercial Manager assumes day-to-day responsibility for the centre and receives a small salary enhancement in return.

It is at this stage of the review that **options 2 and 3** begin to present themselves for consideration by the Board.

Option 2 – Satrosphere continues to operate entirely independently but with reduced capacity. Support services could potentially be offered by some of the organisations present at the Board table, maybe others e.g. TechFest SetPoint (public engagement – delivery vehicle) or where necessary bought in on an ad-hoc basis e.g. IT repairs, carpentry skills for exhibit repair;

Option 3 – Satrosphere receives support from Sensation (Dundee) initially under a form of management contract arrangement (to be costed), for review at the year-end. Both organisations are sufficiently similar (facilities and outputs) to benefit from shared resources and specialisms. Greater financial stability could lead to both organisations becoming more closely aligned but would be subject to the approval of funders, both Boards and other major stakeholders. Early benefits would include the sharing of best practice between organisations.

The detail of option 3 requires further discussion between key partners, notably the Boards of both Satrosphere and Sensation and the Scottish Government.

The slimmer Satrosphere will require careful consideration over which activities it engages in, in order to maximise education and commercial opportunity, while not over extending itself. In this regard consideration has been given to whether the organisation should reduce its operating hours. An initial review would suggest that savings in hourly paid staff for, perhaps, a 5 day a week operation would be offset against losing commercial income. In this sense it is recommended that Satrosphere continues as a 7-day operation for the foreseeable future.

5.0 Operations

The review has benefited considerably from being able to talk to staff. While key issues associated with staff have previously been identified others exist which Directors need to consider. In the proposed new structure a sound, focussed and professional duty management (DM) structure will be critical to effective delivery. Rather than the largely separate weekday and weekend operations, Satrosphere needs to adopt a very consistent approach and one likely to require some training. In addition to consistency across the 7-day operation, there is also a need to build one team. While typically helpful when necessary there remains a need to get all departments communicating with each other and ideally on a daily basis. A training needs analysis would identify suitable opportunities for building a stronger team unit. Current staff with DM responsibility openly admitted to not having had fire training. When probed further it also became apparent that staff did not know where important documents like the crisis management files were kept. Additionally, given the significance of health and safety to any organisation it was surprising to find that no monthly health and safety audit is currently carried out. Something of a siege type mentality was in evidence in the management team as they work to find solutions to the current situation. This has led to a 'fire-fighting' or reactive approach to tackling

operational issues and in this regard a full review of health and safety would be sensible at a very early opportunity. Health and safety is a significant commitment for both executive and non-executive members and a named Director should be identified to take on responsibility for this.

As a consequence of the recommended redundancies the technical workshop should also be closed.

In the short term (end of current financial year) any ‘faulty’ exhibits should be removed from the floor and replaced with others from Satrosphere’s store. Every effort should be made to ensure that the visitor experience is not substantially downgraded as a result of the changes that must now come into effect.

6.0 Education

The HMIe review of Satrosphere, conducted in 2006, identified a number of areas for improvement which, substantially, remain in need of address. One early concern is that the HMIe report has not been openly shared with staff and in light of this it is not surprising why things have not advanced.

Professor Jack Jackson declined to lend support to this review on grounds that it presented a possible conflict of interest with his continuing contribution to HMIe. Professor Jackson did, however, suggest Jackie Heaton (School of Education, Aberdeen University) be approached. During the course of the week I did meet with Jackie and had a positive conversation around how she might lend support to the organisation.

At face value there does appear to be a need to raise quality standards across the organisation generally and if regular training associated with education and delivery could be achieved (through Sensation and potentially others input) this would be no bad starting point.

Once early operational issues are taken care of there is great potential for Satrosphere to significantly improve performance in all areas and perhaps most importantly its science and education related outputs. There is no reason why Satrosphere could not achieve the equivalent of a 4 star HMIe rating by the time of the next HMIe inspections with the right approach and this should be a key objective for the organisation.

In addition to ‘delivery’ based improvements to Satrosphere’s education base there is also a need to develop the main exhibition, which is currently incoherent and almost certainly not effective in securing audience engagement and improvements in scientific literacy. Significant address of this objective will be dependent upon the availability of future capital funds.

Satrosphere appears to have had mixed success in its use of travelling exhibitions. Satrosphere has recently installed a temporary exhibition (Jet, Set, Go) from science centre, @t-Bristol, but has no marketing strategy in place in order to maximise this opportunity. This is something that Sensation could quickly implement in efforts to maximise benefit during the October holidays, the last key trading month of the year.

In briefly considering a longer-term strategic focus for Satrosphere there would be great merit in focussing the science being promoted at Satrosphere. This would effectively allow the exhibition to tell the visitor a story, one which is both coherent and connected. There would also be sense in addressing the open-plan style of the centre at an appropriate stage.

Early themes for a future Satrosphere such as weather, climate change, the environment and renewable energy have an Aberdeen focus and are areas of science that younger visitors often appear to have an inherent engagement with.

7.0 Stakeholder Engagement

There was little time available to explore this aspect of the review. Much of the recent stakeholder engagement has been towards current and potential funders. This work will need to continue beyond this review and will likely see a flourish of activity in the days following its presentation to the Satrosphere Board. The best output for Satrosphere would be a combination of funder inputs that actually allow the team to get on with the business of addressing the issues and recommendations outlined in this review – this will not happen overnight.

In the period immediately following the implementation / address of these recommendations there would be merit in conducting further research into key user groups or audiences, their perceptions, needs and wants from Satrosphere. This type of research could lead to further meaningful development and at various points of delivery.

8.0 Next Steps

The earliest actions to be taken by Satrosphere are associated with the adoption of recommendations identified during this review. Since beginning this report the Satrosphere Board have unanimously adopted all recommendations and have already set about implementing them. This is a very positive start to the work of delivering major organisational change at Satrosphere. This early action by Directors also shows a clear demonstration of the Boards desire and commitment to making lasting change. The Board have also agreed to undertake discussions with the Sensation Board and Scottish Executive in efforts to identify an early contribution from Sensation.

This input could have many forms (in addition to assisting with implementation of recommendations) and early examples of possible next steps include:

- Use of tactical marketing and commercial activity in efforts to maximise visitor numbers and commercial opportunities during October 2007, the last holiday month of the year;
- Development of a business plan for 2008/09 (including a forward looking marketing strategy);
- Development of a detailed budget for 2008/09;
- Work with the Satrosphere team to address HMIE feedback;
- Develop staffing policies and procedures in preparation for a future pursuit of Investors in People;

Whole Business Review – Satrosphere Science Centre

- Work towards a new and dynamic organisational culture, one that emphasises quality, engagement, credibility and openness.

Appendix 1. Recommendations

a. Finance

Recommendation 1.

Directors should confirm that Aberdeen City Council is happy to continue to act as guarantor for the Satrosphere overdraft facility as a matter of urgency.

Recommendation 2.

The Board consider and approve the suggested downsizing of staff. Discussions with those in affected positions should commence at the earliest opportunity. The redundancy process should be concluded by the 1st November, if at all possible.

Recommendation 3.

The Board should seek external professional support in ensuring the centre follows the correct procedures for conducting redundancies.

Recommendation 4.

Aged creditors (over 90 days) totalling over £17k at September 3rd should be paid at the earliest opportunity in order to avoid recovery action being taken.

Recommendation 5.

Satrosphere's cash position should be checked daily by a named employee until further notice. Additionally a nominated Director should review cash balances a minimum of weekly until further notice. This would be best achieved by a nominated Director being given internet clearance for checking Satrosphere bank balances.

Recommendation 6.

Directors should attempt to negotiate an extension on the date for repayment of the Scottish Executive's £72k capital funding.

Recommendation 7.

Directors should adopt the revised 'budget' and monitor performance against this on a regular basis. Directors are urged to review and confirm the accuracy of figures provided before adoption.

Recommendation 8.

Brief staff on the current financial situation and what is being done to address this.

Recommendation 9.

Terminate marketing contract with effect from 1st October 2007.

Whole Business Review – Satrosphere Science Centre

Recommendation 10.

Implement a system for reporting monthly (consolidated) management accounts to Directors at future Board meetings.

Recommendation 11.

Consider the suitability of different accounting software packages to include factors such as appropriateness for size of organisation, resource implications, ease of use, timing of changeover, etc.

b. Management

Recommendation 12.

Directors should make an early decision over whether the current Chair remains in post or an alternative interim (initially) appointment is made.

Recommendation 13.

Current Commercial Manager assumes day-to-day responsibility for the centre in new structure.

Recommendation 14.

Form a sub-committee of the Board which, at least initially, meets monthly and which focuses on the commercial viability / performance of the centre. This group should also be tasked with identifying a suitable management information system which delivers timely and effective information.

Recommendation 15.

Early dialogue with University Directors should be advanced in efforts to establish how the three (Satrosphere being the third) might better work together in servicing a shared interest in knowledge transfer and public engagement with science.

Recommendation 16.

Council based Directors should seek to identify suitably senior and qualified representatives within their own education departments for possible involvement at Board level.

Recommendation 17.

Conduct a search for new Directors with marketing, human resource and commercial experience and potentially (but not exclusively) based in relevant organisations e.g. energy.

Recommendation 18.

Directors nominate a member of the Board to have responsibility for Health and Safety. The Board may also wish to consider establishing a small audit committee, to also comprise members of Satrosphere staff with day to day responsibility for health and safety.

Recommendation 19.

All Directors should undertake some form of Director related continuous professional development during the next twelve month.

Recommendation 20.

Change Board days and times to ensure the majority of Directors are able to attend future meetings.

Recommendation 21.

Directors ensure that all staff are trained in both fire safety and evacuation procedures as a matter of urgency. Health and safety reporting (documented) should additionally be reported at future Board meetings.

Recommendation 22.

Directors implement a health and safety audit of the centre at an early opportunity and review this monthly.

Recommendation 23.

Directors should have all staff paperwork reviewed to ensure it meets with good practice. Directors may also wish to consider a future pursuit of Investors in People.

Recommendation 24.

Organisational culture needs further evaluation and development in efforts to create a one-team approach.

Recommendation 25.

Schedule staff appraisals and ensure these happen before the end of December.

Recommendation 26.

Re-instate daily team briefs with immediate effect. Implement a new system of weekly briefings / meetings for staff in more senior positions.

Whole Business Review – Satrosphere Science Centre

c. Efficiency and Effectiveness

Recommendation 27.

Satrosphere continues to open as a 7-day operation until further notice.

Recommendation 28.

Continue dialogue with Jackie Heaton (Aberdeen University) and work towards her having regular contact (weekly) with the education team.

Recommendation 29.

Undertake monthly stock takes in commercial departments.

APPENDIX 4

SATROSPHERE BUSINESS PLAN 2008-2011

3-YEAR BUSINESS PLAN

Satrosphere Science Centre

2008/09-2012/3

Contents	Pge.
1.0 Review of 2007/08 performance and impact on 2008-13 business planning	3
2.0 Vision and focus for 2008-13	5
2.1 Objectives 2008/09	6
3.0 Performance management, reporting and future key performance indicators	7
4.0 Human resource management	8
4.1 Board Development	10
4.2 Organisation chart	11
5.0 Education and exhibition development	12
5.1 Exhibition development	13
6.0 Commercial	15
6.1 Retail	15
6.2 Café	15
6.3 Corporate events	16
7.0 Finance	17

1.0 A review of 2007/08 and impact on 2008-2013 business planning

2007-08 was a year of major change for Satrosphere, the most significant since its move to the Tram sheds in 2004 and potentially since opening in 1989. The necessity for these changes was driven by a steadily declining financial performance, a decline that came to a head in September 2007. At this time the Board requested Paul Jennings, Chief Executive of Dundee Science Centre (Sensation) to conduct a whole business review of the centre. This review identified 29 major recommendations, which fell into the categories of finance, management and efficiency and effectiveness. The Board adopted all 29 recommendations and have set about implementing these over the last six months. These recommendations included 7 redundancies amongst them the Chief Executive and Operations and Education Manager.

In addition to these wide-ranging recommendations Paul Jennings also encouraged the Board to consider Dundee Science Centre lending management support, initially for a six month period, under a management contract management arrangement. The Board approved this approach and entered into a management contract with Dundee Science Centre on the 1st October 2007. The management support provided by Dundee Science Centre has included resolving a host of operational issues, managing stakeholder relationships (internal and external) and ultimately reversing Satrosphere's recent financial ill health/

Since Sensation's involvement Satrosphere has undergone many changes that will better prepare it for the business-planning period to follow. During this period Satrosphere has the potential to realise a business model, which delivers an annual break-even financial performance, and begin tapping the latent potential which still exists within Scotland's longest established science centre.

Changes made / secured during the last six months include:

- Release of Scottish Government revenue funds totalling in excess of £80k. These were being withheld because of Satrosphere's poor financial state of health;
- Release of additional Scottish Government grants totalling in excess of £125k to address Her Majesty's Inspectorate of Education (HMIE) recommendations;
- Secured £21,250 transport subsidy from Scottish Government to encourage education based visits from Aberdeen City and Aberdeenshire with the prospect of further £30k being available during the next academic year;
- Option of redressing £72k Scottish Government capital grant repayment through match-funding activities;

- Development and adoption of Satrosphere's first health and safety policy;
- Implementation of Cooksafe;
- Revision of employee contracts to ensure these meet with current employment law;
- Development and launch of new website;
- Recruitment of a new seasonal team;
- Review of insurance policies which achieved £5k saving;
- Redress of numerous operational issues to include establishment of new 'essential' maintenance contracts;
- Development of Easter 2008 marketing campaign around climate change based temporary exhibition.

While by no means exhaustive this list demonstrates the range of activities undertaken in order to prepare Satrosphere for 2008/09. Additional highlights during 2007/08 include:

- Aberdeen City Council release of £10k towards funded school visits during 2007/08 and indicating support for £30k worth of visits during 2008/09;
- Aberdeen University commitment of £10k towards revenue funding;
- Robert Gordon University commitment of £10k towards future knowledge-transfer developments that have an 'energy-futures' emphasis.

In essence the collective support and associated activities of the last six months have provided Satrosphere with an important opportunity to be positive about its future. That support for Satrosphere has been so strong and from so many quarters is very encouraging and bodes well for a business plan in which the recent momentum around change must continue. In this sense the emphasis of both management support and Board during the next year must be to continue to make changes which safeguard the long-term future of Satrosphere. Once made these changes must become an integral function of how Satrosphere moves forward.

Collectively these efforts will quickly transform Satrosphere's reputation into one of being a credible and professional regional resource. A change in exhibition focus, to be discussed later, has the potential to raise Satrosphere's profile to a position of national importance.

Other notable events during 2007/08 included:

- Scottish Government commitment to further three year funding of the SSCN, including a shift in distribution mechanism;
- Completion of Halcrow report commissioned by Scottish Government that considered recent actions and future interventions;
- Conduct of science centre review by the House of Commons Science and Technology Committee.

2.0 Focus for 2008-13

Following a very turbulent year in 2007/08, 2008/09 must see an important period of stability being achieved at Satrosphere. Efforts made during the last six months have been working towards this but successes achieved during this time must be firmly cemented if Satrosphere is to begin to realise growth in both outputs and importantly outcomes during years two and three of this plan. There are a number of elements to this work, which will be advanced during the next twelve months.

The first of these areas is soundly managing the recent investment committed by the Scottish Government in addressing Satrosphere's HMIE recommendations. These were highlighted by HMIE following its review of Satrosphere in September 2006. The HMIE review was critical of Satrosphere and much work is needed to ensure the next HMIE inspection in 2009 is entirely more positive. The work associated with the recently secured funding makes this ambition a very achievable one. Much of this work will focus on improving communication and developing a dynamic and competent education team.

Secondly, efforts to develop educational effectiveness will be supported by the installation of a climate change based temporary exhibition (Vanishing Ice) and associated marketing activity that should provide a much needed boost to Satrosphere's visibility and during its key trading months. This focus on headlining exhibitions will see Satrosphere move away from constantly changing weekend event programmes which Satrosphere cannot afford and which anecdotally have been poorly attended during the last year.

Lastly and most fundamental to future plans is the need to better professionalise Satrosphere. This effort must encompass all aspects of the centre, its appearance, its systems and processes and its dealings with audiences and

wider stakeholder groups. The effort required to achieve this position will be a significant one and needs to be at the heart of both Director and staff efforts if it is to be achieved.

More broadly, a concerted effort to revitalise Satrosphere's marketing activity and significantly raise a positive profile, that counters recent negative press coverage, will also support important growth in delivering against new Scottish Government objectives for each of the four Scottish science centres.

Consolidation of the ongoing change agenda for 2008/09 coupled with a more commercial approach to operations during year two of this planning cycle will strengthen Satrosphere's underlying business model and holds the potential of seeing Satrosphere deliver consistent breakeven performances in future years. This strengthening of business model will also see Satrosphere pursuing growth strategies from 2010 onwards.

2.1 Objectives 2008/09

	2007/08	2008/09	2009/10	2010/11
Visitor numbers		43,577	45,000	48,000
Revenue		271,679		
Gross Profit		200,122		
Other income		256,588		
Total overheads		377,335		
Net surplus		79,375		

NB. The performance levels above are based on the indication of £170k revenue support for 2008/09 and similar levels being secured for both 2009 and 2010. The Sensation fee of £72k (exc. VAT) will reduce overall performance to a breakeven position for the year.

- Install Vanishing Ice exhibition for launch at Easter 2008;
- Install 20 hire exhibits from Techniquist between April 2008 and early January 2009;
- Recruit several new salaried employees to a new management team;

- Develop management information systems which deliver timely and accurate management information by 31st October 2008;
- Address of HMIE feedback by 31st March 2009;
- Secure a minimum of £72k matched support for development of energy futures based exhibits by 31st December 2008;
- Secure Investors in People (IiP) by 31st March 2009.

3.0 Performance management, reporting and future key performance indicators (KPIs)

Performance management and reporting have been historic weaknesses of Satrosphere and almost certainly contributed to the delay in identifying the extent of financial crisis facing Satrosphere during late 2007. This has been due in part to a lack of robust systems and processes but additionally the lack of emphasis placed on them by consecutive senior executives and arguably non-executive Directors. The absence of a detailed budget against which to manage the business is the clearest example of this.

Major changes in the way in which the Scottish Government plans to distribute funding across the Scottish Science Centres Network (SSCN) during the next three years will place far greater emphasis on monitoring and reporting performance achievements. Several principles underpin the government's new approach to funding:

- The focus of Scottish Ministers on achievement of outputs, outcomes and value for money for all public investment;
- A desire by the Scottish Government to see a more consistent quality of delivery across the Network;
- The SSCN Strategy 2005-09 states that by 2007-08, the "level of support for Centres [should be] more strongly linked to outputs";

- The independent review of government funding of SSCN since 2004 commissioned from Halcrow consultants recommended an output and outcome-based approach to funding, linked to performance objectives and each Centre's share of Network paying visitors;
- The 2007 HMIE review of Centres', which recommended a more extended commitment to funding centres plus provision of further subsidies to cover the costs of school transport to the Centres.

The future emphasis by government on visitor numbers will make it critical that Satrosphere grows its market share as funding levels will be determined against visitor levels. Beyond simple visitor numbers there will also be a requirement of Satrosphere to become more sophisticated in profiling its audience and evaluating the experience that they receive. Satrosphere will develop its new approach to collecting, measuring and interpreting relevant data in association with the other members of the SSCN. This will allow a commonality of reporting across the Network that the government has stated it expects. Within this new approach there will be scope to benchmark, most likely with Dundee Science Centre, but also potentially others across the UK of similar size to Satrosphere. A framework of KPIs is currently being assembled and should be available for adoption from 1st April 2008.

4.0 Human resource management

Perhaps the most significant changes seen at Satrosphere during the last six months have been those associated with staffing. Following the managed redundancy of seven posts a number of other staff, including salaried employees, left because of the significant changes taking place at the time and the uncertainty over Satrosphere's future that accompanied this. The subsequent lack of staff has impeded the necessary recovery process while efforts to recruit new employees has been slowed by Aberdeen's buoyant employment market. Recruitment was also initially slowed by the need to minimise all expenditure. Senior management duties during this period have been carried out by Dundee Science Centre and while not desirable have achieved the levels of change across the organisation that were necessary. On arrival Dundee Science Centre staff found the following staffing related issues:

- Many employees had not been issued with a contract of employment;
- Staff had not received an appraisal in over twelve months;
- Several staff were being paid below the minimum wage;

- Staff time off in lieu (TOIL) levels were at unacceptable / unaffordable levels;
- Little or no staff discipline being implemented;
- Staff critical of previous management.

These issues have now been redressed and put Satrosphere on a much more stable footing from which to recruit new staff. New recruits now receive full induction training and Monday's between November and the end of February have been designated as training days.

One other notable staffing issue from Satrosphere's recent past was that during his last year in post the previous Chief Executive was failing to communicate with staff on many levels, an issue that was identified during Satrosphere's last HMIE inspection. The effects of this have been felt across the organisation and have caused significant damage to the centre and its employees. Current emphasis on improving communication across the team and driving a 'one-team' approach are now starting to show good results. Funds secured from the Scottish Government will further enhance this activity and with other staffing initiatives including improving staffing related systems / procedures and staff welfare provide a basis from which to retain good staff and consider a future pursuit of Investors in People (IIP), most likely in 2009. To secure IIP following a period of such major change would be highly significant achievement in continued efforts to realise a financially and intellectually sustainable Satrosphere.

Having previously identified Satrosphere's low staffing levels much effort is currently being put into recruiting several new hourly paid and salaried staff. The proposed new structure is shown below (4.1) and includes provision for the appointment of a Senior Operations Manager, Education and Development Manager, Outreach and Events Officer and two Education Officers. Following failed attempts to secure the continued input of seconded teacher, Susan Hogg, it is also hoped that a new Seconded Teacher can be appointed in early 2008. That both Council's remain highly supportive of funding a seconded teacher is very significant.

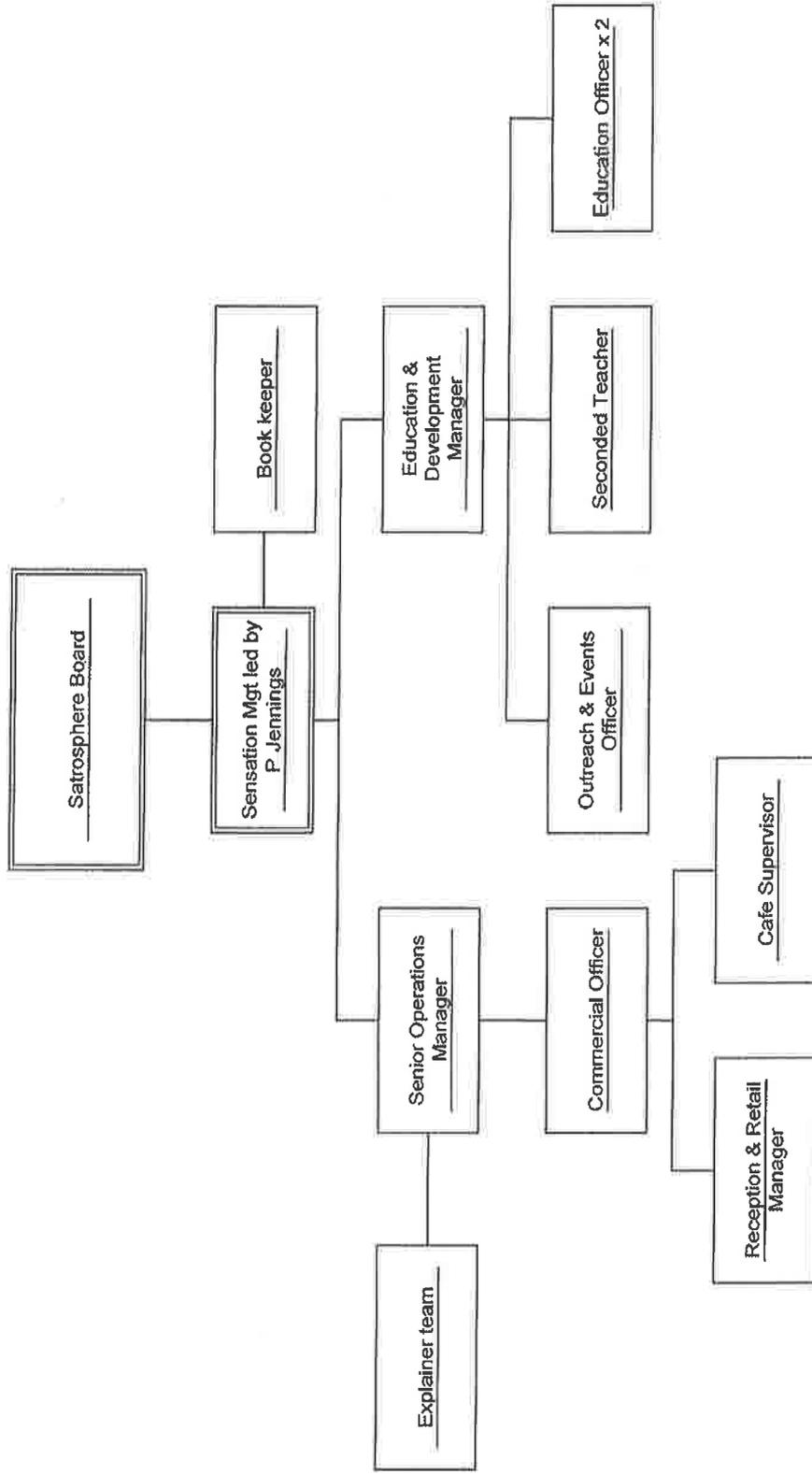
The hourly paid structure of staffing will become much more flexible in efforts to establish a more robust and efficient business model. The likelihood of an increase in both seasonal visits and corporate customers makes this new approach the most sensible one.

Recent efforts to multi-skill staff will also continue in attempts to realise a highly flexible and dynamic workforce for Satrosphere, one able to better react to changes in its core operation.

4.1 Board Development

In addition to the many staffing needs of the organisation it is also important that Satrosphere continues to develop its non-executive Director capability. The initial business review by P Jennings identified a number of flaws in the governance structure of the organisation and it is essential that recommendation identified at this point are followed through to completion. Areas still in need of redress include all Directors undertaking some form of Director related training. Other recommendations, including the need to strengthen the Board are being slowly advanced albeit there remains a requirement for stronger education and commercially orientated inputs. The appointment of Sue Richardson of Aberdeen University in November 2007 has introduced a much needed finance perspective. The Executive structure will continue to work with Ms Richardson until all outstanding finance related matters are addressed.

4.2 Organisation chart



5.0 Education and exhibition development

Recent funding submissions to the Scottish Government focused on addressing recommendations highlighted by HMIE were very successful. Areas of focus will include:

- Improve teamwork, communication and morale across all staff (allow opportunities to meet, influence policy, evaluate provision and suggest improvements);
- Prepare a clear statement of aims which embodies views of staff, partners and stakeholders;
- Develop rigorous and systematic procedures for self-evaluation and continuous improvement;
- Extend CPD programmes for teachers to include presentation skills, promotion of ACE principles and development of citizenship skills;
- Make further use of centre to showcase local research and developments in industry and higher education.

These elements will be delivered during 2008/09 through the combined efforts of Satrosphere's own team, Dundee Science Centre staff and several external consultants. Collectively these measures and associated actions have the potential to significantly lift the Satrosphere education offering while equally importantly laying foundations for future sustainable delivery of a high quality education service.

In addition to HMIE related activities Satrosphere was additionally awarded a further £21,500 travel subsidy and up to £14,500 for developing education related aspects of its website. The Government's travel subsidy is currently being taken up by schools across Aberdeen City and the Shire and must be committed before the end of the 2008 academic year. Tracking of this funding will be essential in efforts to realise up to a further £30k of travel subsidy for the 2008/09 academic year. This second travel subsidy has added scope for use to encourage community, as well as education based visits.

In addition to funding related education activities there are potentially many additional benefits to be had from Satrosphere and Dundee Science Centre working more closely together. These include:

- Continuous improvement in the quality of Satrosphere's education programme and service;
- Sharing of public programmes between Aberdeen and Dundee;

- Sharing of best practice and the opportunity for developing benchmarks;
- Establishment of a complimentary skill set between centres and emphasis on removing duplication of effort;
- Development of a shared *outreach* mechanism for delivering to the whole of the East of Scotland;
- Strength of position in a Network of just four science centres.

Closer collaboration could significantly enhance the science learning and public engagement opportunities for both centres in a relatively short space of time.

5.1 Exhibition Development

Satrosphere's exhibition space will see several developments during the course of 2008 and beyond. Recent funding secured from the Scottish Government will allow the centre to hire 20 exhibits from Techniquet, the Welsh science centre, between April 2008 and January 2009. This increase in exhibits on the floor will help drive a stronger value for money proposition while giving the management team time to consider how it develops the main exhibition moving forward and likely funders for such a development.

In addition to hire exhibits Satrosphere is also converting a thermal imaging camera purchased in 2007 into a permanent floor exhibit. This will have an energy focus and show the heat signatures of visitors in the exhibition. Associated interpretation will highlight the importance of insulation in reducing energy loss from buildings. This highly visual new exhibit will sit alongside Satrosphere's summer exhibition 'Vanishing Ice'. The travelling exhibition, created by Dundee Science Centre for International Polar Year, will highlight the importance of climate change on all of us. Initially installed pre-Easter 2008 this exhibition will be supplemented by the arrival of a Magic Planet during July and August. The Magic Planet is a highly engaging education tool that supports the use of high impact workshops and presentations on a 24 inch diameter globe. This element of *Vanishing Ice* will also be supported by voting pad technology in efforts to engage Satrosphere visitors with the climate change agenda.

The emphasis during 2008 on energy and climate change is potentially a very significant one for Satrosphere. While science centres the world over have different orientations, some on very focussed aspects of science, others more general, there is a very clear need for a small science centre, like Satrosphere, to move away from promoting general science (which its simply doesn't have the exhibition space to do justice to) to a much more focussed approach. Given

Aberdeen's position as the UK's energy capital, the public's growing interest in renewable energy sources and their intrinsic link with our changing climate there is a very strong argument for Satrosphere to shift its focus to become the 'energy and climate change centre'. While this discussion is still to be had at Board level the change in positioning would lift Satrosphere's profile over night and see it become a showcase for new energy technologies.

In association with this Satrosphere will also develop several other 'energy futures' based exhibits during the course of the next eighteen months. This will be done in conjunction with Dundee Science Centre and Satrosphere's local academic and industry partners. These exhibits will form a new 'energy futures zone' within the main exhibition and support a very useful mechanism for supporting a new knowledge transfer agenda.

While this particular approach has been discussed in the past and notably in terms of plans for a major new energy centre in Aberdeen, these ambitions are several years away and the time to respond to the emergent renewables and climate change agenda is now.

6.0 Commercial

The commercial operation within Satrosphere holds the potential of making the whole science centre much more sustainable and providing strong support to education plans that need to be implemented during the next three years. A historic emphasis on driving volume of sales through the commercial elements of the business will be replaced with a far greater sensitivity towards margins and yield. While turnover will always remain important the refreshed marketing effort drive additional visits and associated commercial revenues. There is greatest opportunity for Satrosphere in focussing on actually generating a surplus from its trading activities.

While somewhat contrary to this last statement, given its typically lower margins, Satrosphere will also adopt the ethical purchasing policy developed by Dundee's Lorraine Springorum but now being adopted across the whole of the SSCN.

6.1 Retail

Satrosphere's shop has many positive things going for it and has historically generated a healthy turnover. The retail emphasis during the course of this plan will be on further diversifying stock ranges and importantly securing economies of scale through Satrosphere's links with Dundee Science Centre and potentially other members of the SSCN.

6.2 Café

The adoption of Starbucks has worked well for Satrosphere and affords the opportunity to generate a 70% plus margin on most of its beverages. What has worked less well is a menu of labour intensive 'make to order' items and a recent worrying trend of purchasing food (including for corporate events) from the local supermarket. This poor practice has now been stopped. Staffing issues in catering, as with other areas of the centre, have caused a range of problems but these are now slowly being overcome.

Perhaps most worrying was the very poor hygiene standards in evidence as recent as several months ago. The extent of this was such that health and hygiene had clearly not been a priority for some time. While staffing that staff were Cooksafe trained the reality was that only the Catering Supervisor had been trained in Cooksafe and she left in October 2007. More positively all Satrosphere staff have now gone through Cooksafe training. This coupled with a recent deep clean of the kitchen has thankfully seen things improve significantly.

At a more stable point in time, potentially beyond the end of the 2008 main season further consideration needs to be given to potentially outsourcing the Satrosphere catering operation to a commercial operator. This has the potential to generate a far better return for Satrosphere while also releasing the many resources currently tied up by this side of Satrosphere's business.

6.3 *Corporate events*

The most significant commercial opportunity facing Satrosphere during the course of this plan is an aggressive assault on Aberdeen's corporate event market. Since moving to the Tram sheds in 2002 Satrosphere has had a steady flow of corporate clients hiring its meeting spaces. This impressive level of interest has largely been generated because Aberdeen has a shortage of affordable corporate hire spaces, the type of which the Tram sheds has in abundance. In 2006/07 Satrosphere generated a turnover of over £40k from its corporate based business, a level of business that has the potential to be doubled with the right emphasis.

Subject to the availability of funds the whole of Satrosphere's first floor could be given over to corporate facilities. This would include converting the existing open plan office into a professional banqueting suite, providing two already popular meeting rooms and potentially offering a business space where corporate clients using the facility could access a range of business services including internet access, fax facilities, etc. Existing staff could be readily located to another area of the centre.

In addition to the physical changes needed to fully tap the potential of a developing corporate audience Satrosphere would also need to become significantly more professional in its handling of this market, from enquiry through to delivery.

Rather than detracting from Satrosphere's public engagement and science learning activities an expansion in corporate facilities would see a growing and increasingly diverse 'public' using the many flexible spaces on offer.

7.0 Finance

Financial difficulties encountered by Satrosphere during 2007 have led to a very different type of business plan for 2008-13. Longer term ambitions around expansion and potentially moving to a new Energy Future's Centre, which have not been substantially discussed during this plan, need to give way to addressing a financial legacy that will always leave Satrosphere vulnerable if not tackled. The level of support shown by all major funders during recent difficult times has been encouraging and demonstrates that the centre's major stakeholders do want to see Satrosphere continue to operate. The plans detailed above have the potential to quickly move Satrosphere to a more solvent position and to actually make it a resource of both regional and wider importance during the life of this plan.

The Scottish Governments interest in outputs and in the longer-term outcomes was highlighted previously. Based on current visitor expectations the government has indicated a stable funding source for the next three years (shown below). The move to a three-year contract replaces the previous annual one and will provide Satrosphere with more certainty when planning future budgets.

2008/09	2009/10	2010/11
£170,000	£176,000	£180,000

The maturing approach to funding being demonstrated by the government should not be lost on Satrosphere as a shift to both an outputs and outcomes based approach places far greater pressure on Satrosphere to deliver the targets which it agrees with the Scottish Government. This change in approach demands a change in response to historic performance management by Satrosphere and should encourage / reward year on year performance improvements and across the centre.

APPENDIX 5

GOVERNMENT BRIEFING NOTE TO STUDY CONSULTANT

Paul Jennings

From: Stuart Cuthbert [stuart@members.v21.co.uk]
Sent: 12 January 2006 14:01
To: Paul Jennings
Subject: Facility review meeting

Good afternoon Paul,

This is just a note to confirm our meeting at Sensation on Wednesday 18/01/2006 at 1100. The following is a copy of my original briefing note from Michael, which will form the basis of our discussion.

Steuart,

I work in the Science and Society Team, part of ETLLED within the Scottish Executive. We have responsibility for the funding of the four Scottish science centres and smaller science and society initiatives with the overall aim to engender a 'culture of science' and improve the scientific literacy of civic Scottish society.

Frank Creamer and I have recently been discussing the requirement for an independent evaluation of the educational facilities within each of the four science centres in Scotland, namely:

- Sensation, Dundee;
- Satrosphere, Aberdeen;
- Our Dynamic Earth, Edinburgh; and,
- Glasgow Science Centre

to examine their suitability for continuing professional development in science education to be delivered in each location. This would be aimed at everyone involved in science education in Scotland, not dissimilar to the Science Learning Centre approach in England.

We were wondering if you would consider undertaking such a piece of work, and, in the event you would be happy to do so, please could you provide an indication of how much you would charge to undertake this?

The aim of the project would be to establish the extent to which the existing facilities at each of the centres may be enhanced to support teacher CPD courses which might be delivered in association with locally-based higher education institutions. These courses often require laboratory equipment and other technical facilities and it is important that we establish just how feasible it would be in the short-term; say over the next 6 to 9 months, to enhance these facilities to make them suitable, as we recognize that it might not be possible to support such courses in all (or perhaps any) of the centres at present.

As a starting point, it would be necessary for you to meet with officials from the Scottish Schools Equipment Research Centre and also with Dr Stuart Monro, Scientific Director of Our Dynamic Earth, who is also Chair of the Education sub-group for the Scottish Science Centre Network to discuss this matter, and then progress to:

- Examine the existing educational provision within each of the four centres. We would like you to consider the existing education facilities in terms of conference room space (including capacity issues), current ICT and TV/Video production provision, sound-proofing, lighting, audio amplification arrangements, capacity to change existing seating configuration arrangements, catering and tea/coffee

facilities and facilities for reprographics;

- Discuss the range of existing education provision to schools, including the 'catchment' areas which each centre serves, the age-range of young people visiting, the number of school visits per year and the numbers of young people involved, the existing teaching materials that are available to support school visits, how the science centre staff support schools during their visits and the nature and extent of pre- and post- school visit support;
- Consider the appropriateness of existing education provision for schools to be extended to CPD provision for teachers outwith school visits. In particular comment upon:
 - (a) the quality of existing laboratory facilities;
 - (b) the capacity of the Centre to upgrade or create laboratory facilities that would adequately support teacher CPD visits;
 - (c) the capacity of each of the centres to support teacher visits in terms of the number of teachers that might be accommodated ;
 - (d) support facilities that are, or could be made available, for those who will deliver teach CPD;
 - (e) any 'equipment' issues that need to be addressed;
 - (f) the capacity of education staff to offer those undertaking CPD training, an opportunity to tour the centre; and,
 - (g) the proximity of reasonably good accommodation for visiting teachers who may be undertaking an over-night training course.

We imagine that the project will take no longer than two to three weeks. This will include time for preparation, travel, report writing and to make an allowance for appointments with the science centre staff. On the whole, it should be sufficient to meet with someone from the education team in each of the centres. However, we will ensure that the Chief Executive of each centre would be informed of your involvement in this piece of work, and ask them to ensure that you receive all available assistance in the pursuit of your enquiries.

Finally, it would be helpful if you could provide an indication of your estimation of the cost required to bring each of the centres' facilities up to the required standard.

I anticipate that it may be appropriate for you, Frank and I to meet up to discuss this, so I'd be grateful if you could give me an indication of your availability over the next few weeks so that you could meet with us either here at Europa Building in Glasgow, or at Victoria Quay in Edinburgh.

All the best,

Michael Roy

The other matter that I should like to discuss is the possibility of the Tayside and Fife Section of ASE and Satrosphere running a joint event for teachers in March 2006.

With regards,

Steuart

Steuart Cuthbert
Field Officer
ASE Scotland
Knoehhead
Comrie
Perthshire
PH6 2LS
01764 670 751
steuartcuthbert@ase.org.uk
www.ase.org.uk
www.asescotland.org.uk

APPENDIX 6

DSC SECTION OF SCIENCE LEARNING CENTRE STUDY

From: Paul Jennings
Sent: 20 November 2008 12:09
To: Louise Smith
Subject: FW: Science Centre Review

Attachments: Proposals for Sensation.doc

From: Steuart Cuthbert [mailto:steuart@members.v21.co.uk]
Sent: 19 February 2006 22:46
To: Paul Jennings
Subject: Science Centre Review

Hi Paul,

You asked me to give you some idea of the requirements to provide a facility to accommodate 200 delegates. I have had a long discussion with Michael about your proposal. I am afraid that Michael is not in favour of the larger facility. He has acknowledged that it will be necessary to provide a new build at Sensation if they are to go ahead with the SLC upgrade. He did suggest to me that we should work with a nominal figure of 50 delegates for the Sensation provision. I have considered the basic needs in a centre to provide the standard type of CPD programme, which is:

Registration/Refreshments
Welcome address – whole group
Keynote address – whole group
Workshops – small group activities
Lunch/Refreshments
Workshops – small group activities
Keynote address – whole group
Plenary session – whole group.

Thus the requirement is for accommodation to cope with the total number of delegates and a number of small groups of 20 – 40 depending on the nature of the activity. The nature of the activities means that it is unlikely that there would be opportunities to effect major changes to the accommodation layouts during the CPD activity.

On the basis of this structure, I have suggested the minimum accommodation structure required

I have given suggestion for two models:

- a. 50 delegates as requested by Michael
- b. 200 delegates.

During our discussion, you suggested that you would wish to attract conferences like the ASE Scotland Annual Conference. There is indeed, a number of similar events throughout the year. These meetings, however, usually attract a significant number of exhibitors.

The proposed structure would accommodate meetings similar to that of the Institute of Physics in June, but for the ASE, we should require a large space for an exhibition in addition to the accommodation shown. For example, for our conference in March we are using:

1 x 400sqm – Lecture Theatre
2 x 80 sqm – Workshop rooms
5 x 50 sqm – Workshop rooms
Dining Room
400 sqm (Total) – exhibition space – Refreshment area within this space
24 sqm – Reception area

Our delegate numbers are currently 170.

I have attached a suggested accommodation "List" to this e-mail.

Please call me if you wish to discuss this matter further. I shall be at home late afternoon Monday, away Tuesday & Wednesday, at home am Thursday (up to 1330) and all day Friday – I work from home – the contact information shown below.

With regards,

Steuart

Steuart Cuthbert
Field Officer
ASE Scotland
Knowehead
Comrie
Perthshire
PH6 2LS
01764 670 751
steuarcuthbert@ase.org.uk
www.ase.org.uk
www.asescotland.org.uk

APPENDIX 7

GRANT APPLICATION – DUNDEE SCIENCE CENTRE FEASIBILITY STUDY

**Development of a SCIENCE LEARNING
CENTRE
PROPOSAL for a FEASIBILITY STUDY**

**to: the Director; Scottish Science Centres Program, Scottish
Executive**

by: SENSATION, Dundee's Science Centre

background

Currently based solely in England, Science Learning Centres are a national network providing a focal point for professional development in science teaching. The Centres aim to support teachers to learn more about contemporary scientific ideas while experimenting with effective teaching approaches and gaining experience of advanced scientific techniques.

There are nine regional Centres in England and one National Centre (York) to serve the UK. Each of the Centres has a main base with online resources which can be accessed by teachers. They offer courses in the latest scientific research and industrial applications to science teachers, technicians, Further Education lecturers and teachers tackling the ethics of science in society.

At this time Scotland does not have an equivalent resource.

We at Sensation, Dundee's Science Centre, wish to explore the possibility of providing a Science Learning Centre for Scotland located adjacent to, but integrated with, our current building.

the case for a Science Learning Centre at Sensation

Sensation aspires to operate the best small science and discovery centre in the world. We are highly ambitious for our future and that of the newly formed Scottish Science Centres Network. Over the coming months and years we intend to position ourselves as a key scientific resource and centre of educational excellence.

We focus on running an efficient and well-governed business and are now advancing this, in key areas, to a status of best practice. This strategy will support the sustainability of our business and put the centre in a stronger position to pursue major opportunities as they arise.

The potential for locating a Science Learning Centre (SLC) at Sensation represents one such major opportunity.

We intend to increasingly focus on developing the scientific and educational potential of the Centre. This will be supported by a subgroup of the Board who will utilise their own exceptional scientific knowledge to develop inspirational ideas.

Historically we have been consistent in our ability to "punch above our weight". Sensation was awarded one of the highest grant(s) from ReDiscover funds and, as a result, we have been able to comprehensively redevelop our Centre during the last 12 months.

For us it makes sense to locate a Scottish SLC within Dundee Science Centre. It will significantly advance our efforts to position ourselves as a key educational resource within the region and, indeed, Scotland.

Sensation's proximity to, and strong links with, Dundee's Universities; Ninewells Teaching Hospital plus Biomedical Park; and, Greenmarket Digital Media Park, combined with an already strong reputation amongst visiting teachers, makes Dundee the perfect location.

our Proposal

The '*Scottish Science Centres Network Four Year Strategy*' gives the clearest demonstration of confidence in its ability to deliver a framework that will make an important contribution to Scotland's future knowledge economy.

It recognises that more than other visitor attractions Scotland's science centres need to inspire, innovate and aspire to world-class status.

If the Science Centres are to be positioned at the heart of science education in Scotland they must compliment the educational curriculum while still encouraging and informing debate, (both formal and informal), amongst their many visitors.

Science Learning Centre

In January 2006, the Scottish Executive commissioned an initial study to look at how the four Scottish Science Centres might incorporate a Science Learning Centre into their operating structure. .

The model we would like to explore comprises of:-

- a. Reception area:
to accommodate reception and information. Also refreshment/break-out area able to accommodate greeting and hospitality
- b. "drop-in" Resource Centre
- c. Workshop areas (3)
areas to be flexibly designed incorporating moveable walling, but with each able to accommodate between 20 to 50 delegates depending on seating style and arrangement
- d. Lecture Theatre
a single area permitting a theatre arrangement to accommodate around 100 delegates,
- e. fully equipped Laboratory (to accommodate 20 delegates)
- f. Technician/Preparation area
- g. Chemical storage
- h. ICT control room and store

Knowledge Transfer Gallery

We would propose a Knowledge Transfer Gallery (KTG) be located within the Science Learning Centre. This would create a space where local universities and industry/business can communicate to the general public, teachers and older school children the pioneering work and research being carried out both in Tayside and Scotland.

The space would be flexible, housing exhibitions and graphics displaying this research. Content would constantly be varied to reflect the changing face of scientific research.

Currently no mechanism on this scale exists for promoting public engagement with "real" scientific research in Scotland.

Blowoman

The arts and sciences have often throughout time been a source of mutual inspiration. Although the historical tensions between these 'two cultures' are well documented, an ever growing body of arts and science research and production lends weight to the view that these interdisciplinary collaborations are increasingly compelling.

Since the 1980's Dundee has been in the forefront of Public Art in Scotland. That Sensation stands at the nexus of Dundee's Cultural Quarter and Digital Media Park gives impetus to the concept to create a landmark sculpture at this point, emphasizing the sci-art inter-relationship.

Blowoman started life as a piece of creative sculpture intended to draw clear links between the world of science and art. A nine foot model has been created and, if realised to full scale (25 metres), it would become a confident iconic "bioColossus" nonchalantly straddling the area between the arts and sciences, emphasizing the importance of Dundee as a leading centre for research into the life sciences.

We would like to investigate the feasibility of constructing *Blowoman* on the Sensation/SLC site as a link between the two buildings and demonstrating the inter-connectivity between art and the application of science.

cost of feasibility study

After in-depth discussions with our professional advisors, we have put together a cost proposal for the total feasibility study. This is based on the Knowledge Transfer Gallery being located within the Science Learning Centre and, therefore, integral to it. In submitting a total cost for the study which includes *Blowoman*, it is acknowledged the sculpture might be considered as a separate entity. We have, therefore, detailed its cost breakdown figures included in the main bid.

for Science Learning Centre; Knowledge Transfer Gallery; and, Blowoman

Architectural Services	38,200.00
Quantity Surveying Services	7,000.00
Structural Engineering Services	11,000.00
Building Services	4,000.00

Groundwork Intelligence	900.00
Project Management (Including travel)	5,400.00

** Details of costs itemised in Appendix £ 66,500.00

Cost included in above for Biowoman

Architectural Services	14,400.00
Quantity Surveying Services	2,500.00
Structural Engineering Services	6,000.00
Building Services	1,500.00

** Details of costs itemised in Appendix £ 24,400.00

expected outcomes from study

The prime objective of this feasibility study will be to convince potential funders that the project is not merely viable but that we can demonstrate sufficient detailed analysis has been undertaken to guarantee the facility can be built within the parameters of cost, time and quality that we both promise and aspire to.

The product of the study will be a "funder-friendly" presentation package. It will be ICT based with CAD plans and elevations plus a "walk-through" 3D model.

Behind this, however, we will hold our technical, financial and business plans.

We will be able to clearly prove we have considered and investigated various essential elements such as:-

- | | |
|--|---|
| a. Site Ownership | i. A Strategic Brief |
| b. Building Design Function & Location | j. Criteria for management of the project |
| c. Topographic Surveys | k. Risk Analysis |
| d. Geotechnical Investigations | l. A Procurement Strategy |
| e. Foundation & Structural Design | m. A master Programme |
| f. Public Utility investigation | n. A master Cost Plan, |
| g. Building Services strategy | |
| h. Liaison with Local Authority on their Statutory Function(s) | |

funding strategy

Conterminous with this study on the capital works for the facility we will commence work on the identification of potential funders. This will undoubtedly entail formulating a Business Case together with a Business Model and Management Plan.

We note, in England, the Science Learning Centre network was a joint initiative between the Department for Education and Skills and the biomedical research charity Wellcome Trust, We further note all English SLCs have very strong links with their local Universities. Finally we note SLC South West is a partnership between @Bristol and the local universities.

As a starting point we would initiate a dialogue with both the National Science Learning Centre and SLC South West to attempt to identify common ground and, by benefiting from their experience, reduce our own time and effort input requirement.

We will also commence discussions with all local Universities. They have already indicated their interest in the project and, in the past, have given enormous support to our projects.

We recognise capital costs are only the beginning of our efforts and we will require to produce a business model which demonstrates the revenue implications of the project and how we shall continue to fund the facility on a year by year basis.

With these in place along with the Feasibility Study we consider we can present a strong and sound case for a Science Learning Centre based in Dundee to potential funders.

Dundee Science Centre
04 August 2006

Proposals for Sensation -- Upgrade to Science Learning Centre.

Model 1. -- To accommodate 50 delegates

- a. Reception area -- minimum of 30m² to accommodate reception desk and information boards. This assumes that the delegates can access the current restaurant area for welcome refreshments. If the Science Learning Facility is to be completely self-contained a refreshment area to accommodate a buffet style meal would be required -- I suggest a minimum of 40 sq m in addition to the reception area
- b. Workshop areas x 3 x 70 m² -- This would allow each area to accommodate up to 50 delegates in theatre style or 20 delegates in "cabaret" (workshop) style. The areas should be separated by moveable partitions. This would allow a variety of arrangements but would also allow the provision of a single area of 250 m². This would permit a theatre arrangement to accommodate over 100 delegates, and an area that could be used for corporate functions. The partitions must be sound insulated to the highest possible standard. The presentation areas should be at opposite ends of the areas to minimise disturbance.
- c. Fully equipped laboratory x 1 x 80m² to accommodate 20 delegates
- d. Technician/preparation area x 1 x 40m² -- this could act as a second lab for up to 10 delegates as required, but should be equipped for full technical support
- e. Chemical storage -- 20m² - with the appropriate shelving, metal cupboards, ventilation and security. Positioned adjacent to the technician room

Model 2 -- to accommodate 200 delegates

- a. Reception area -- minimum of 30m² to accommodate reception desk and information boards. This assumes that the delegates can access the current restaurant area for welcome refreshments. If the Science Learning Facility is to be completely self-contained a refreshment area to accommodate a buffet style meal would be required -- I suggest a minimum of 80sq m in addition to the reception area
- b. Conference Room/Lecture Theatre -- 400 m².
- c. Workshop areas -- a minimum of 7 x 70 m² This would allow each area to accommodate up to 50 delegates in theatre style or 20 delegates in "cabaret" (workshop) style. The areas should be separated by moveable partitions. This would allow a variety of arrangements but would also allow the provision of a single area of 500m². The partitions must be sound insulated to the highest possible standard.
- d. Fully equipped laboratories x 2 x 80m² to accommodate 20 delegates each
- e. Technician/preparation area x 1 x 40m² -- this could act as an additional lab for up to 10 delegates as required, but should be equipped for full technical support
- f. Chemical storage -- 20m² - with the appropriate shelving, metal cupboards, ventilation and security. Positioned adjacent to the technician room

APPENDIX 8

PROGRESS REPORT AND DRAFT PROJECT INITIATION DOCUMENT

Dundee Science Centre Science Learning Centre Project

Progress Report to:	May 2008	to:	Scottish Government
Recipient:	Dundee Science Centre	Prepared by:	Louise Smith
Project name:	Science Learning Centre	Authorised by:	Paul Jennings

Progress Report and draft Project Initiation Document

INTRODUCTION

Scotland has a distinctive science and engineering tradition within a culture where education is valued. Provision of a modern and appropriate science education facility will be a keystone in the development of Scotland's knowledge economy, its education systems and its society.

"Scotland must invest in science education to produce a new generation of pioneers."

Sir David Lane, May 2008

EXECUTIVE SUMMARY

Our mission is to connect with the Scottish public, encouraging the perception in the younger generation, that science represents a national advantage worth participating in.

Our aim will be to promote science, science learning, research & development by communicating with our national audience in an innovative, inspiring and engaging way. In doing so we can encourage our community to engage with scientific issues, inspire a greater uptake of the sciences at further education level by promoting science careers, widen access and develop our audience, and additionally attract international excellence in the area of science learning.

Dundee Science Centre aspires to be the best small science centre in the world, and through existing government funding is working towards this goal. This new Science Learning Centre, with a strong international research agenda, will advance our understanding of public engagement and science learning. This agenda will complement the existing mission of the science centre.

We will promote greater connectivity throughout the whole area of non-school science learning engendering a more robust confidence and competence in scientific issues.

Our vision for Scotland's SLC is underpinned by a sustainable business. The impact of the SLC, with its many facets, will be to underscore Dundee Science Centre's ambitions while providing a key towards our future sustainability.

The SLC will be home to seven major functions:

- i A Knowledge Transfer Gallery showcasing the best in Dundee, St. Andrews and the wider Scottish scientific community research and pioneering developments.
- ii A Chair for Public Engagement with Science and Science Learning incorporating a strong research agenda.
- iii Create Scotland's key resource for the Continuing Professional Development of our science teaching professionals. The quality of this facility will convey to teaching professionals a sense that they are valued and supported in their learning and development. This resource will include the most up to date laboratory equipment.
- iv Create a state-of-the-art conference facility majoring on the academic community

- v Create a library resource for teaching professionals
- vi Develop a co-ordinated base for other science institutions and organisations.
- vii Creation of Colossus

A major, detailed feasibility study relating both to all aspects of the site and the proposed building on it has been undertaken together with a thorough market assessment.

Our record to date, both as a business and project management team, proves we have the capabilities to achieve this project

We have developed many working partnerships and view them as core to our organisations development and success. A stakeholder analysis is being compiled.

THE VISION

Scotland's Science Learning Centre will be an inventive, nation wide project drawing on the strengths of the key partners :-

Dundee Science Centre	:	University of Dundee
University of Abertay	:	University of St Andrews
Scotland's scientific communities		

Our vision is for greater connectivity throughout the whole area of non-school science learning. By taking a strategic, holistic view of science learning we can work towards growing the in-reach and out-reach aspects of our work. We intend to draw on relevant expertise, and working with the Universities, we can identify the most appropriate and innovative approaches to teaching and learning, and adapt these to a science context.

The Science Learning Centre, accessibly located in Scotland, and adjacent to Dundee Science Centre will be constructed, integrating Knowledge Transfer; Science Learning, Continuing Professional Development, Laboratory facilities, learning spaces, library resources

The SLC will co-ordinate expertise in science learning and development for teachers, technicians, learning support assistants, scientists, science communicators and educationalists. We will engage teachers with the wider science communication community and create a central resource where teaching professionals can develop, improve and inspire.

We will ensure a sustainable programme of CPD in support of the introduction of the Curriculum for Excellence. The SLC will promote Improved connections and synergies between schools and Higher Education Institutions. This should help teachers to stay up-to-date in the science they are teaching so that they feel confident in using current ideas.

To date, Scotland has not had a strategic, long-term approach to science learning and professional development. Our collaborative approach means we can bring the best expertise in both formal and informal learning to introduce an imaginative and relevant programme of CPD. This is required to support teaching professionals as they rise to the new challenges faced in the science teaching field.

By drawing on specialist skills for formal and Informal learning, and creating a unique environment where teaching professionals support each other, we can make the changes to the teaching culture required to create Scotland's knowledge economy.

OBJECTIVES

Science Learning Centres, (SLC), exist in England as a national network for professional development in science teaching. Centres support teaching professionals in enhancing their skills by learning more about contemporary scientific ideas and in experimenting with effective teaching approaches and gaining experience of modern scientific techniques.

The main aim, in England is to improve science teaching, raise morale in teaching and inspire pupils by providing exciting, intellectually stimulating and relevant science education.

There are currently no SLCs in Scotland. We will create Scotland's Science Learning Centre, connected and adjacent to Dundee Science Centre.

Our vision for Scotland's SLC draws on broader themes, and is underpinned by a sustainable business.

Dundee Science Centre aspires to operate the best small science and discovery centre in the world. We are highly ambitious for our future and intend to position ourselves as a key scientific resource and centre of educational excellence. The impact of the SLC with its many facets will be to underscore our ambitions while providing a key towards our future sustainability.

A multi-faceted project will mean a facility unique in the United Kingdom. An iconic building, the SLC will be home to seven major components:

1. Create a Knowledge Transfer Gallery showcasing the best in Dundee and St. Andrews science. *This will offer a contemporary and engaging experience of life sciences; biomedical developments; and, the wider science agenda.*

Promoting public engagement with science and encouraging excitement about new developments, discoveries and research, will be paramount to the success of this gallery. It will be an experience created for the public like no other in Scotland.

Aimed at the general public, teachers and older school children, a space will be created where the local universities and industry/businesses can communicate the pioneering new work and research they are undertaking in the local surrounding area and wider Scotland.

The space will be flexible and could house exhibitions and graphics displaying this research. This element would constantly be renewed to reflect the changing face of scientific research. Currently no mechanism exists on this scale in Scotland to promote public engagement with "real" scientific research.

2. Create a Chair for Public Engagement with Science and Science Learning with a strong research agenda.

In association with the University of Dundee, we will attract a pioneer in this field. The Chair will advance our understanding of public engagement with science. This will further advance Dundee's international reputation for excellence in the Life Sciences arena as well as inform our developments in the Continuous Professional Development for science educationalists.

3. Create Scotland's key resource for the Continuing Professional Development of our science teaching professionals.

The rapid pace of scientific research places our science teaching professionals in a unique position in comparison to other teaching disciplines.

A bespoke resource for Scotland will offer the most up to date, innovative and engaging teaching techniques and courses.

The Scottish Science centres network are already engaging with a quality assurance and accreditation system for its educational programmes and this will underpin and be embedded in CPD offered to Scotland's teaching professionals.

The facility that would be realised will give teaching professionals a sense that they are valued and supported in their learning and development.

4. Create a state-of-the-art conference facility

Our market assessment research indicated Dundee loses out to other cities for academic conferences as current venues do not offer the required facilities.

This facility will offer a service not only to the academic community and but will also fill an identified gap in the wider local market, thus supporting the project's wider sustainability.

A multi-functional building with five star conference facilities, break out spaces, meeting rooms, lab facilities and lecture theatres will offer academics and professionals in the Tayside and wider area a unique conference and meeting venue.

Key stakeholders have indicated a wide use of this facility if realised, such as a teaching venue for surgeons at Ninewells Teaching Hospital using live data feed from international surgeons carrying out pioneering techniques.

5. Create a library resource for teaching professionals

By introducing innovative learning tools, this facility will be available for all teaching professionals on a loan basis. We know that teachers lack the budget and time to research innovative ways of engaging pupils in science activities.

This resource will specialise in filling this market niche.

6. Develop a co-ordinated base for other science institutions and organisations.

Organisations such as the BA, STEM (Science Technology Engineering and Maths) Partnership and other key organisations working with the public engagement of science, CPD and science learning agendas require closer working environments to create a joined-up approach to science engagement and CPD. By offering a home to individuals within these organisations, we can create a truly innovative approach to Scotland's science community – a one-stop shop where sharing of best practice, developments and knowledge improve Scotland's science learning agenda

7. Creation of Colossus

Formerly known as Blowman, this ninety foot sculpture conceptualised by international artist and sculpture David Mach is intended to draw clear links between the world of science and art. A nine foot model has been created and if realised to full scale would be a confident iconic statement about Dundee as a leading centre for research into the life sciences. Colossus could be built on the Dundee Science Centre/SLC site as a link between the two buildings.

FEASIBILITY

background:

In 2005 the Scottish Government commissioned a study to consider creating a SLC for Scotland. This study identified that DSC had the appetite and ability to construct a SLC of at least regional, if not national, importance.

This study was followed-up by commissioning DSC to co-ordinate a detailed feasibility study which had three major elements:

1. Could a new facility be built on land owned by DSC?
2. What might a new facility look like?
3. What would be the associated costs of creating this new facility?

our feasibility investigations:

- Analysis of potential building location
- Analysis of incorporating Colossus into the site
- Ground condition analysis
- Site ownership investigation
- Development of size and number of units
- Design development
- Pre-planning meeting with local planning authority
- Service information (electricity, gas, telecom, water, drainage etc...)
- Preparation of promotional artwork to include visuals, graphics, sketches, text explanation, and animated 3D walkthrough
- Risk analysis and compliance with building regulations
- Stage 1 provisional development budget cost appraisal.
- Indication of timescales

This in-depth design study was developed and completed in 2007 by a professional construction team headed by AIM Design Architects plus associated structural, mechanical and building services engineers. It has been costed in depth by a Ralph Ogg & Partners, chartered Quantity Surveyors

The study determined the project was indeed perfectly feasible and did not uncover any significant problems that might lead to major on-costs.

A further commission was an in-depth Market Assessment by an independent consultant supported by Scottish Enterprise. This has allowed us to better understand and quantify the level of demand for such a new facility.

the Project Team and Project Approach:

Our record to date, both as a business and a project management team, proves we have the capabilities to achieve this project

The completion of this high-quality and iconic facility, to budget and on time, might in itself be viewed as a successful outcome to the project, but the real outcomes will be the activities engendered by the building. It must be home to a largely self-financing, sustainable enterprise which is viewed as a valued resource by the science community in Scotland, and potentially wider.

We have researched our markets and produced business plans with financial models. We are confident successful completion of this project is achievable.

An underlying objective in our audience development will be to democratise science; promoting science to and connecting within the whole field of non-school science learning, offering access on an inclusive basis. To maximise our resource and be financially effective, we will have produced an adaptable facility capable of targeting and servicing a variety of potential audiences.

These include:

- Teaching professionals
- Local audience : teenage and young adults will feature heavily in our audience targeting and development
- Organisations involved in Public Understanding of Science
- CPD providers
- Dundee's ambassador programme consisting of 140 academic personnel that regularly bring conferences to the Tayside area
- Other conference markets via the Convention Bureau

To underpin the operation of the organisation with sound financial management and governance – a financially sustainable business the project will be under the direct supervision of our Chief Executive and Board through our very experienced in-house team. The Project Executive, *(the person responsible for the project)*, shall be Louise Smith. Louise ran our ReDiscover projects and also has extensive business experience. Louise shall again be assisted by David Robertson as Project Advisor. David, a Chartered Civil Engineer, was formerly Head of Projects at Scottish Enterprise, Tayside.

Given our in-depth feasibility study, the procurement route will most likely be 'design and build' with a guaranteed maximum price. We shall, however, retain an independent team of professional advisers to review the works as design and construction proceeds.

We have already developed the design of the building to a considerable extent, plus, investigated site conditions; availability of utility services; and, access. We are confident the building will have an effective layout and flow; will be energy efficient; have low maintenance costs; and, with the flexibility to accommodate changing markets. We will produce a sustainable building and will seek a BREEAM assessment based on renewable technologies. We shall also take account of the Disability Discrimination Act and other relevant legislation.

PARTNERSHIPS

Dundee Science Centre has developed many working partnerships over the last eight years, and views them as core to our organisations development and success.

Our stakeholder analysis and development work to date has involved meeting with key organisations that could form the partners for the project. Below are listed some of these:

- **University of Dundee :**
Principle Sir Alan Langlands with Vice-Principle(s)
- **University of Abertay :**
Principle Bernard King with Professor Mike Swanston, Vice-Principle
- **University of St. Andrews**
- **Her Majesty's Inspectorate for Education (HMIe)** – Professor Jack Jackson
- **Scottish Science Centre's Network**
Our Dynamic Earth; Glasgow Science Centre; Satrosphere Science Centre
- **Scottish Crop Research Institute**
- **plus**
Tayside STEM Partnership; SSERC; Institute of Physics; The BA ;
Association of Science Educators

The outline project has had a very positive response with stakeholders offering backing and agreement to continue supporting to the next phase.

The next stage of development will be to formalise these partnerships and discuss involvement in the project.

PROJECT COST & FUNDRAISING

The first phase of the feasibility has been completed and a detailed costing exercise undertaken demonstrating a capital cost of £20million (including £3 million for the construction of Colossus).

We aim to secure 25% of the initial project costs through local, regional and national fundraising activities.

Early indication from our local trust organisations is that positive support and a commitment to providing cash is genuinely present. Dundee Science Centre Endowment fund has also committed to providing finances.

next steps

The next steps for the project will be critical to the success of the project. Progress has been relatively slow due to the project team working on a part-time basis.

With this in mind Louise Smith must be seconded full-time to drive the project for a full 12-month period. Miss Smith would be supported by David Robertson on a part-time basis.

Listed below are the key activities that the project team will engage with over the next period, and will require funding to progress.

- Develop and fund the project team
- Second where necessary and at the appropriate stage of the development other professionals to lend support to the business plan and budget development, fundraising strategy
- Second when necessary senior science learning specialist
- Develop an MSc in Science Communication along with Dundee's Universities
- Develop our funding bid documents for the Wellcome Trust and other key organisations
- Engage and secure commitment to all local partners and stakeholders for project
- Continue to build relationships and commitment from Universities
- In-depth risk study of the project, allowing for consultation with the National Science Learning Centre in York, At-Bristol Science Learning Centre, and others where appropriate to learn from best practice as well as mistakes to avoid
- In-depth study to determine conference and other corporate potential – both academic users and wider audience – Convention bureau
- Investigation, along with University of Dundee, to identify suitable pioneers in the fields of science learning and public engagement who may champion the project and allow for recruitment of Science Learning Chair
- Developing Business Model and Financial Plan including Risk Assessment and Stakeholder Analysis
- Create organisational Structure with detailed costs
- Understand the road map to excellent BREEAM rating for the new facility (without which we could not apply for European funding)
- Develop closer links with Scotland's best CPD delivery organisations
- Create a bespoke programme of CPD delivery concentrating initially on Pedagogy, Management and Leadership delivery for new Principle Teachers of Science and CPD for newly qualified teaching professionals

It is estimated that the next 12-month phase of the project will cost £300,000.

With financial assistance from the Scottish Government we have already investigated in some detail the feasibility of our proposals. We have had in-depth discussions with, and received enthusiastic support from, potential stakeholders at both national and local level. We have developed the design of the building to a considerable extent. We have also funded a comprehensive market assessment.

Based on these investigations we are confident that the project is viable representing sound value for money. We will produce an efficient, sustainable building based on renewable technologies. We will build an effective, sustainable business based on sound commercial practices.