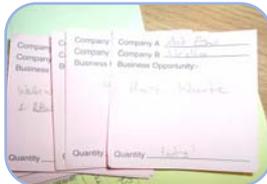




NATIONAL INDUSTRIAL SYMBIOSIS PROGRAMME (NISP)

NISP STRATEGY EXECUTIVE SUMMARY



June 2007



Scott Wilson Business Consultancy

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National Industrial Symbiosis Programme (NISP)

NISP Strategy Executive Summary

14 June 2007

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TABLE OF CONTENTS

TABLE OF CONTENTS	1
1 REPORT FINDINGS	2
1.1 Summary Table and Conclusions	2
2 NISP ACTIVITY	3
2.1 How NISP adds value	3
2.1.1 <i>Measuring outputs</i>	3
3 NISP'S SUCCESS AND ACHIEVEMENTS TO DATE	4
3.1 Defra BREW Metrics	4
3.1.1 <i>Economic Metrics</i>	4
3.1.2 <i>Environmental Metrics</i>	5
3.2 Other Metrics Reported to BREW	7
3.3 NISP provides value for money.	8
3.4 Economic impact	9
3.5 Embraced by business community	9
3.6 Scalability	10
4 BENEFITS OF GROWING NISP OVER 2008-2011	11
4.1 Model Forecasts for the Brew Metrics	11
4.2 Membership	11
4.3 Value for Money Analysis	12
4.4 Impact on Statutory Environmental Targets	13
4.5 Value for Money – Comparative BREW Programmes	13
4.6 Contribution to HMG's Kyoto Protocol Target	14
5 APPENDIX	15
5.1 Assignment Purpose and Approach	15
5.2 Attribution	15

1 REPORT FINDINGS

1.1 Summary Table and Conclusions

The main findings from the Report¹ are:

- NISP has achieved remarkable success to date in delivering key economic and environmental outputs and is gaining an excellent reputation internationally;
- NISP is the established leading delivery 'platform' for BREW based outputs and very good value for money;
- Over time NISP has delivered proportionally more output per unit of additional funding for many activities. This scalability has the potential to increase further such that the output delivery per unit of funding will to continue to expand; and
- NISP presents a continuing opportunity for catalysing sustainable growth and innovation in the UK. At the same time NISP will continue to deliver on many Government carbon (Kyoto Protocol) and environmental agendas and targets (UK and international) and provides tangible wider economic benefits to the UK as a whole.

The table below summarises NISP's achievements to date.

Table 1.1: NISP's Success to Date

Value for £1 invested	Years 1 & 2 Aggregates	Years 1 & 2 Net of NISP Attribution ²
Value of New Markets to UK Industry	£98.9m	£85.9m
Private Sector Investment	£66.7m	£66.7m
Cost savings to UK industry	£71.0m	£53.5m
Landfill Diverted (t)	1.8m	1.2m
CO2 Reduction (t)	2.0m	1.44m
Hazardous Waste Eliminated (t)	490 thousand	245 thousand
Virgin Material Saved (t)	5.4m	4.2m
Water Saved (t)	2.5m	2.3m
Jobs - Saved	669	535
- Created	522	418
People Trained	2,062	1,650

¹ The scope of the Report is in the Appendix.

² Attribution is defined in the Appendix.



2 NISP ACTIVITY

2.1 How NISP adds value

The National Industrial Symbiosis Programme (NISP) aims to deliver greater resource efficiency and reduce consumption by encouraging the adoption of ecological principles through industrial symbiosis (IS) by businesses. Industrial Symbiosis is, in essence, one company using another company's waste material as input to its productive process. Expanding this activity leads to the creation of new markets and resource efficiencies that combine to release market inefficiencies. This catalytic effect/phenomenon helps to explain the outstanding results of the programme.

The programme's distinctive operational leverage lies in its power to influence "upstream" production aspects. NISP brings together companies and organisations of all sectors and sizes to achieve industrial symbiosis. This generates cost savings, new sales opportunities, and significant environmental benefits such as reduced greenhouse gas emissions. Further social benefits include new businesses and employment. Productivity gains are achieved through process re-engineering by innovation and new technologies being deployed. NISP also creates opportunities for UK businesses to penetrate environmental technology markets and waste management strategies across the world.

NISP is a centrally coordinated programme with a national strategy delivered regionally through regional partners. This structure provides an incentive for regional partners to deliver credible and high quality outputs. Their performance can ultimately be benchmarked with collaborating partners across the country for best practice comparison.

2.1.1 *Measuring outputs*

Outputs resulting from an industrial symbiosis engagement can be classified in two broad terms: environmental and economic. Under Defra's Business Resource Efficiency & Waste (BREW) funding programme, schemes are measured against seven key outputs (metrics) across two categories. Five environmental metrics are: reduction in carbon dioxide emissions (in tonnes), diversion of landfill waste (tonnes), elimination of hazardous waste (tonnes), virgin materials saved (tonnes) and the reduction in the use of potable water (tonnes/cubic m³). The two economic outputs are additional sales to industry and cost savings (pounds sterling).

As an integral part of the programme's holistic approach, NISP records an additional four non-BREW outputs, (i) number of jobs saved per year, (ii) number of jobs created per year, (iii) number of people trained per year and (iv) private investment level in reprocessing/recycling per year.

3 NISP'S SUCCESS AND ACHIEVEMENTS TO DATE

3.1 Defra BREW Metrics

The Programme's ability to contribute to the seven cross-programme comparable BREW metrics (and exceed targets) puts NISP at the forefront of delivering the economic and environmental benefits to the UK and exceeds any similarly BREW funded programme.

3.1.1 Economic Metrics

Additional Sales

One of the main economic benefits resulting from industrial symbiosis activity is the creation of new 'waste' markets that would not exist without NISP. 'Additional sales' represent the value of sales directly resulting from engagement in a NISP synergy and the new business generated. This new business should be viewed as distinct from normal sales development as it is sales growth resulting from NISP involvement. Additional sales contribute directly to an increase in the profitability of an organisation and thus feed through to additional corporate tax revenue to the Exchequer (surplus in the case of third sector organisations).

Table 3.1: NISP Driven Additional Sales: Output and Attribution

Sales (£ nominal)	2005/06 'Year 1'	2006/07 'Year 2'	Total
Gross Output	16,500,000	82,400,000	98,900,000
NISP Attribution	0.86	0.87	0.86
Net Output	14,200,000	71,700,000	85,900,000

The total gross amount of additional sales, reported by companies engaged in the programme, reached almost £100 million for the first two years of the NISP programme. Moreover, there was a substantial (almost five-fold) increase in total sales from year 1 (£16.5m) to year 2 (£82.4m). In terms of the BREW targets, NISP exceeded these by 350%.

Cost Savings

One of the ways in which cost savings occur is by not having to send waste to landfill. Firms gain benefits from a more productive different method of resource allocation. Through the avoidance of landfilling a company is able to save landfill taxes, landfill site charges and transportation costs. An average factor of £40 per tonne of landfill cost avoided is applied to deduce a unit cost saving. Hazardous landfill carries a higher factor per tonne due to the specific nature of the waste. Cost savings therefore will be considerably higher compared to normal waste.

Normal behaviour of firms in the short term may result in part of the cost savings into increased profits. Over a longer time period economic theory suggests that, in a competitive market, cost reductions will largely be passed on to consumers in the form of price benefits.

Table 3.2: Cost Savings: Output and Attribution

Cost savings (£)	Year 1	Year 2	Total
Gross Output	36,500,000	34,600,000	71,100,000
NISP Attribution	0.87	0.63	0.75
Net Output	31,600,000	21,900,000	53,500,000

As table 3.2 shows, the first two years of BREW funding of NISP have yielded just over £71m of cost savings. After attribution, net cost savings for the two years are £53.5m.

3.1.2 Environmental Metrics

Materials diverted from Landfill (Tonnes)

The Landfill Directive restricts the types and amounts of waste that can be sent to landfill. This directive works in conjunction with the landfill tax, which provides an incentive for businesses to reduce waste through more efficient use of resources. Landfill Diversion is measured as the waste diverted from landfill in tonnes per year.

Over the first two years of the BREW programme, NISP has diverted nearly 1.8 million tonnes gross of waste from landfill. Adjusting for attribution, which over the two year period averaged 67%, yields a net figure of 1.2m tonnes of landfill reduction.

Table 3.3: Landfill Diverted: Output and Attribution

Landfill Diverted (t)	Year 1	Year 2	Total
Gross Output	858,477	931,218	1,789,695
NISP Attribution	0.62	0.72	0.67
Net Output	530,474	669,535	1,200,009

The programme has had success in relation to commercial and industrial landfill diversion targets for the governments Waste Strategy. In 2006/07, NISP provided a gross accrued landfill diversion equivalent to close to 50% of the annual total C&I landfill reduction achieved in England in 2003.

Energy Reduction as CO₂ Saved (Tonnes)

Reducing carbon dioxide emissions along with more efficient use of landfill are two key government initiatives within the environment agenda. Energy reduction is measured in tonnes CO₂ per year, such as from direct fuel savings, or a reduction in electricity use.

Table.3.4: CO₂ Reductions: Output and Attribution

CO ₂ Reductions	Year 1	Year 2	Total
Gross Output	328,964	1,690,574	2,019,538
NISP Attribution	0.85	0.68	0.77
Net Output	279,820	1,157,390	1,437,210

Carbon dioxide savings within the NISP programme have improved significantly. NISP is contributing to the UK meeting its targets set by the Kyoto Protocol. The accrued benefit for CO₂ is equivalent to 1.9% of any one year of the Government's commitment to the Kyoto protocol's carbon reduction target.

Hazardous Waste eliminated (Tonnes)

Hazardous waste poses particular risk to health and the environment so it is especially important that it is managed properly. Hazardous waste forms around 2% of total Commercial and Industrial waste.

The Hazardous Waste Directive³ (HWD) defines hazardous waste as waste catalogued on a list drawn up by the European Commission, possessing one or more of 14 hazardous properties. The Landfill Directive sets tight standards on waste that can go to landfill, with the result that more co-ordination is required to deal with it. This includes greater sampling, testing and treatment. Disposal of hazardous waste has a higher cost than other types of waste.

Table 3.5: Hazardous Materials Diverted: Output and Attribution

Hazardous Materials (t)	Year 1	Year 2	Total
Gross Output	201,700	287,793	489,493
NISP Attribution	0.50	0.50	0.50
Net Output	100,394	144,801	245,195

Table 3.5 shows total gross hazardous waste diverted by NISP over the first two years of BREW funding was 489,493 tonnes. Total net output claimed, after an attribution adjustment of 50%, was 245,195 tonnes.

³ The Hazardous Waste Directive (2005) for England and Wales (Source: DEFRA website)

Virgin Materials Saved (Tonnes)

Virgin material displacement is a measurement in tonnes per year of raw materials saved or offset by increased efficiencies or a change to renewable material.

Table 3.6: Virgin Materials Saved: Output and Attribution

Virgin materials (t)	Year 1	Year 2	Total
Gross Output	1,303,102	4,066,650	5,369,752
NISP Attribution	0.63	0.83	0.73
Net Output	820,268	3,359,821	4,180,089

4.2 million tonnes of virgin material were saved over the first two years of the BREW programme by NISP. Gross output figures increased by over three times in the first two years whilst the net figure is over four times higher between the two periods which is a reflection of the increase in attribution from 63% to 83%.

Water Saved (Tonnes)

Historically, water savings is a positive externality stemming out of a matching process of resource allocation between two organisations where the benefit of a symbiosis is 'water saved'⁴. However, direct synergies, where water is the essential good which matches two companies together in the IS process, is a growth area.

Table.3.7: Water Savings: Output and Attribution

Water (t)	Year 1	Year 2	Total
Gross Output	264,475	2,241,040	2,505,515
NISP Attribution	0.50	0.97	0.74
Net Output	132,238	2,181,540	2,313,778

Industry water savings of potable water amount to just over 2.5m of gross tonnes. High attribution and gross water savings for year 2 yield a proportionally high overall net saving value of 2,313,778 tonnes for the two year period between May 2005 and April 2007.

3.2 Other Metrics Reported to BREW

Industrial symbiosis involves the creation of a wider set of economic and social benefits that are not captured by the seven BREW metrics. NISP records and submits four additional outputs. These are: jobs created, jobs safeguarded, number

⁴ Water is defined as potable water.

of people trained per year and level of private investment committed to reprocessing and recycling.

Table 3.8: Summary of Additional Benefits

Other Metrics	Year 1	Year 2	Total
Jobs Created	187	335	522
Jobs Saved	238	431	669
People trained per year	874	1188	2062
Private investment in reprocessing/recycling (£ '000s)	22,553	44,163	66,716

As the table above shows, all four outputs have recorded positive growth in the first two years of NISP. Job creation segment has a positive 'multiplier' effect on the economy generating wider socio-economic benefits. NISP's success in attracting private investment in reprocessing/recycling similarly creates wider benefits for the economy. These are estimated in section 3.2.1 below.

3.3 NISP provides value for money.

- The programme's ability to provide outstanding value in achieving each BREW metric is shown in Table 3.9 below for year 2 (2006/07) of NISP's operation. The cost per tonne of landfill diverted is £1.39; the cost per tonne of CO₂ reduced is 80 pence and so forth.

Table 3.9: £ Cost Per Net Unit of Output (2006/07 prices)

Unit of measurement	Year 2 (2006/07)	Year 3 (2007/08)
Landfill diverted (t)	1.39	0.94
CO2 reduction (t)	0.80	1.79
Virgin materials (t)	0.28	1.46
Hazardous Materials (t)	6.41	10.06
Water (t)	0.43	1.38
Sales (£)	0.01	0.14
Cost savings to industry (£)	0.04	0.10

Notes: (i) Year 3 estimated; (ii) allocates 1/7 of BREW funding per output.

Another way of looking at this is the output provided by £1 of funding as shown in Table 3.10 overleaf.

Table 3.10: Output Per £ Invested (2006/07 prices)

Value for £1 invested	Year 2 (2006/07)	Year 3 (2007/08)
Landfill diverted (t)	0.72	1.10
CO2 reduction (t)	1.25	0.60
Virgin materials (t)	3.62	0.70
Hazardous Materials (t)	0.16	0.10
Water (t)	2.35	0.70
Sales (£)	77.26	7.10
Cost savings to industry (£)	23.59	10.00

Notes: (i) Year 3 estimated; (ii) allocates 1/7 of BREW funding per output.

3.4 Economic impact

NISP has a much wider impact on the United Kingdom than was originally anticipated when the BREW metrics were originally compiled as measures of performance. Through its positive impact on employment (income tax revenue) and company profitability (corporation tax revenue), the programme provides a positive contribution to the Exchequer. These are summarised in Table 3.11.

Table 3.11: Economic Indicators (nominal)

Economic Evaluation	Gross Benefit Year 1 and Year 2	Net Benefit ⁵ Year 1 and Year 2
EGVA (£ million)	66	53
TEVA (£ million)	157	117
New Job Outputs (FTE)	1,792	1,359
Fiscal Impacts (£ million)	12.6	10.3
Funding (£ million)	9.0	9.0

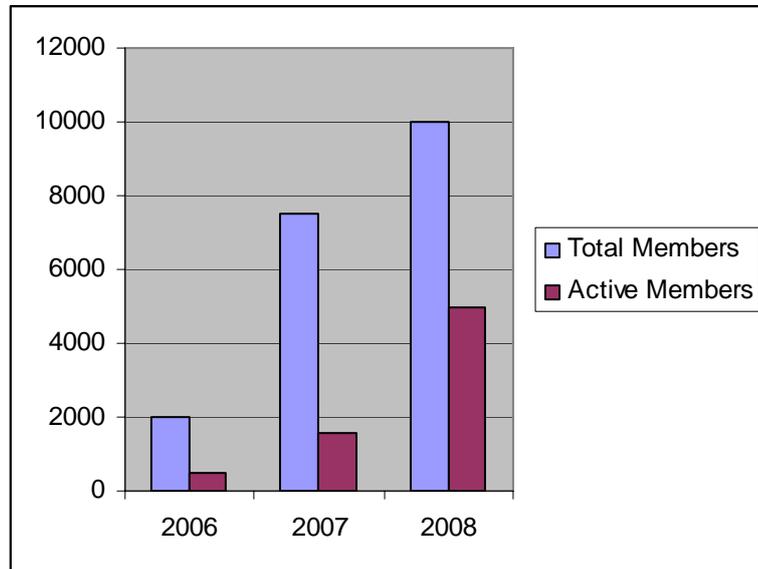
From an input of £9 million BREW funding in the first two years, NISP had a net Economic Gross Value Added of £53 million, created 1,360 full time equivalent jobs and provided a positive net contribution to the Exchequer of £10.3 million.

3.5 Embraced by business community

As shown in chart 3.1 overleaf, NISP's growing membership is a strong indication that the Programme is embraced and valued by the business community. Membership at the end of 2006/07 reached 7,500. ISL is on target to exceed a level of 10,000 NISP members by the end of this 2007/08. Around half are projected to be actively engaged in industrial symbiosis opportunities. This is a high membership rate for a UK business organisation.

⁵ Net of NISP attribution.

Chart 3.1 NISP Memberships 2006-2008 (2008 est.)



3.6 Scalability

A key feature of the Programme is its ability to deliver proportionally more output for each unit input of funding. This is also a function of the size and quality of the membership of the Programme, where the high active membership participation is a strong indicator of the success of the Programme. BREW funding in year 2 was some 260% higher than year 1 and yielded scaleable benefits in sales (+500%), CO₂ saved (+410%), virgin materials saved (+410%) and water saved (+1650%).

4 BENEFITS OF GROWING NISP OVER 2008-2011

To model the impact of expanding NISP, Scott Wilson constructed two scenarios of funding growth based on historic precedent and experience. Scenario 'Q' uses a nominal funding escalator of 35% per year over Phase 2 (2008/09 to 2011/12) and the second (Scenario 'R') a step nominal increase of 100% in 2008/09 followed by annual nominal increases of 35%.

4.1 Model Forecasts for the Brew Metrics

The model projects strong output growth for both scenarios. These are in line with the expectations on scalability, NISP's performance to date and additional efficiency gains due to NISP 'using' its learning experience to grow and develop.

Table 4.1: Model Forecasts for Scenario 'Q'

KPI (Net)	Scenario Q			
	Year 3	Year 4	Year 5	Year 6
Landfill diverted (t '000s)	1,294	2,006	3,159	5,055
Carbon Dioxide (t '000s)	679	1,052	1,657	2,651
Virgin materials (t '000s)	834	1,293	2,036	3,258
Hazardous Materials (t)	121,000	187,000	295,000	471,000
Water (t '000s)	882	1,367	2,153	3,445
Sales (£m nominal)	8.38	12.99	20.45	32.72
Cost savings (£m nominal)	11.60	17.99	28.33	45.33

Table 4.2: Model Forecasts for Scenario 'R'

KPI (Net)	Scenario R			
	Year 3	Year 4	Year 5	Year 6
Landfill diverted (t '000s)	1,294	2,783	4,591	7,805
Carbon Dioxide (t '000s)	679	1,459	2,407	4,092
Virgin materials (t '000s)	834	1,793	2,959	5,030
Hazardous Materials (t)	121,000	260,000	428,000	728,000
Water (t '000s)	882	1,896	3,129	5,319
Sales (£m nominal)	8.38	18.01	29.72	50.52
Cost savings (£m nominal)	11.60	24.95	41.17	69.98

4.2 Membership

Total membership is expected to grow by 280% for scenario 'Q' and 450% for scenario 'R'. This level of participation will be a major driver for the Programme's future success.

Table 4.3: Membership Growth for Both Scenarios

Membership	Year 3	Year 4	Year 5	Year 6
Scenario 'Q'	10,000	14,000	19,740	28,031
Scenario 'R'	10,000	20,500	29,725	44,588

4.3 Value for Money Analysis

Both scenarios have significant impacts. Costs per unit of output are reduced, economic benefits increased and there are positive implications for delivery of longer term environmental targets and development opportunities. Table 4.4 provides estimates of the cost per unit of output for Scenarios 'Q' and 'R' for year 6 (2010-11) of the programme.

Table 4.4: Cost Per Net Unit Output for the Scenario Q and R for Year 6 (2006/07 prices)

Cost per Net Output	Modelled Scenario	
	"Q"	"R"
Landfill diverted (t)	0.59	0.57
Carbon Dioxide (t)	1.13	1.08
Virgin materials (t)	0.92	0.88
Hazardous Materials (t)	6.33	6.08
Water (m3)	0.87	0.83
Sales (£ 2006/2007 prices)	0.09	0.09
Cost savings (£2006/2007 prices)	0.07	0.06

Table 4.4 shows that net output costs in both scenarios continue to show very good value for money. There is a multiplier effect on the net benefit of the additional funding, driven by efficiency gains implicit in the Programme's structure and organisational aspirations.

Table 4.5: Forecast Economic Indicators (2006/07 prices)

Economic Evaluation	Year 6	
	Q	R
EGVA £ million	33	51
TEVA £ million	207	319
New Job Outputs	1,293	1,996
Fiscal Impacts £ '000	6,379	9,850
Funding £ '000	20,913	30,983

Very substantial benefits are achievable in "total economic value added", net new job outputs (jobs created, jobs saved and indirect and induced employment) and gross returns to the Exchequer.

4.4 Impact on Statutory Environmental Targets

The modelling outcomes for CO₂ impacts with both scenarios are also impressive. They suggest that NISP is in a position to continue to make a meaningful contribution to meeting the UK Government's Kyoto and other future obligations.

Table 4.6: NISP's Potential Future Contribution to UK Government's Kyoto Obligations for Carbon Dioxide Reductions

Measure	Scenario in Y6 2011/12		Kyoto
	"Q"	"R"	
Carbon (t '000s)	723	1,116	20,650
Kyoto Contribution %	4%	5%	-

At the time of writing, new commercial and industrial waste targets from the government had not been released. However, it is highly probable that NISP will be a major contributor in assisting the government to meet its targets. This track record has been established in the first two years of the programme.

4.5 Value for Money – Comparative BREW Programmes

In 2005 Defra provided a comparator of programmes funded by BREW from the perspective of costs per unit output. Scott Wilson has compared the indicators used by BREW for the two future NISP scenarios against the data shown for the other key programmes for comparative purposes. Table 4.7 below illustrates this comparison versus year one outputs from other selected programmes.

Table 4.7: NISP is the Leader among Comparative Programmes

£ Cost per Unit Net Output	NISP (2010/11)		NISP (yr 1)	Selected Programmes (2005)		
	'Q'	'R'		2005/6	WRAP	Envirowise
Landfill diverted (t)	4.14	3.97	6.80	753	36	n. c.
Carbon (t)	21.54	20.67	35.10	37200	2400	431
Virgin materials (t)	6.42	6.16	4.47	632	128	n. c.
Hazardous Materials (t)	44.34	42.54	24.10	n. c.	1080	n. c.
Water (t)	6.07	5.83	20.20	n. c.	1.82	n. c.
Sales (£ nominal)	0.64	0.61	0.19	6.33	n. c.	n. c.
Cost saving (3 nom)	0.46	0.44	0.08	6.74	0.19	1.3

Notes: (i) n. c. – not captured; (ii) 2006 prices; (iii) allocates entire funding per output.

The analysis presented in the table demonstrates that under both scenarios NISP achieves significantly greater value for money than the other BREW programmes.

Additionally, in year six, scenario R generates the greatest value for money for all BREW metrics.

4.6 Contribution to HMG's Kyoto Protocol Target

NISP provides a substantial boost to reducing carbon emissions and this will continue into the future.

Table 4.8: NISP's Potential Future Contribution to the Kyoto Target

	Year 6 NISP Annual Saving		Kyoto Target
	'Q'	'R'	
Carbon (t '000s)	723	1,116	20,650
Contribution %	4%	5%	-

Under the assumptions of both scenarios Q and R, NISP by year 6, will be making what could possibly be the single largest contributing programme to reducing carbon emissions. For example, under funding scenario R NISP will be contributing 5% of the HMG's commitment to the Kyoto agreement.

Scott Wilson

14 June 2007



5 APPENDIX

5.1 Assignment Purpose and Approach

In March 2007, International Synergies Limited (ISL) commissioned Scott Wilson Business Consultancy (SWBC) to evaluate the future of the National Industrial Symbiosis Programme (NISP) for the period April 2008 to March 2011. In order to complete the research, SWBC and its sub-consultants, the London School of Economics and Political Science, Manchester Economics Ltd, Paikea Ltd, in co-operation with Corporate Climate:

- reviewed in detail ISL's achievements and successes to date over the first two full years of the NISP programme;
- examined the current political climate in order to identify which government departments realise benefits from NISP;
- modelled the socio-economic benefits of NISP funding for period 2009-2011; and
- proposed organisational changes to maximise internal and external benefits from the growth that increased funding has the potential to generate.

5.2 Attribution

Measuring programme outputs is a collaborative process between participating companies and NISP representatives. Once a synergy is completed, the resulting output data is recorded and stored on NISP's own data system, CRISP. In order to verify data quality and ensure reliability and consistency of reporting, NISP have commissioned an independent auditor, Databuild, to perform this task. Databuild are a market research consultancy specialising in researching businesses for government and other public sector bodies. The role played by Databuild is crucial in evaluating mechanisms used by NISP and developing them into a more robust methodology that would fully evaluate the contribution made by NISP to business in the UK.

Initial outputs are subject to an audit by Databuild, who also determine the level of NISP's contribution to generating the output (attribution). Attribution levels aim to define the importance of NISP's role in facilitating a synergy. Levels of attribution are measured from 0 to 1, the greater the value, the greater the importance NISP played in completing the synergy. Outputs that are adjusted for attribution are classified as *net* outputs.

Scott Wilson

14 June 2007