# Study on the Economic Impact of the Research Councils

WP 2 Final report

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# Contents



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# Executive Summary

1. This is the final report on work package 2 (WP2) of a study of the economic impact of the research councils. As requested by the research councils, the report provides guidance on the implementation of balanced scorecards (BSCs) in relation to the knowledge transfer and economic impact generating activities of the councils. The rationale for considering BSCs in this context is:

   - most, if not all, of the councils' objectives are difficult to capture in easily quantifiable indicators
   - most councils have adopted elements of a BSC approach to decision making, or at least analogous processes
   - a scorecard approach is believed to offer the most effective approach to establishing a current snapshot of the economic impact of the work of research councils (what we might loosely term a 'baseline') and building up a more comprehensive understanding of economic impact over time.

2. The report provides guidance only. Knowledge transfer and economic impact is only one of the councils' strategic objectives, albeit of key importance, and a BSC approach needs to encompass these other objectives. This requires a detailed review of decision making processes within the councils which is outside the scope of the current study. In addition, the councils themselves need to be intensively involved in the development and selection of BSC indicators.

3. The report suggests that four types of indicators should be incorporated into the BSC:

   - *selecting the area for investment.* The indicators here are intended to capture the extent to which research users are involved in identifying programme areas and the extent to which UK users are likely to be capable of exploiting results
   - *investments.* These are (long) leading indicators which reflect current expenditure by the research councils.
   - *outputs from investments.* These include, for example, results of completed projects, PhD graduates and so on.
   - *transfer and adoption of outputs.* This category would include a mix of outcome indicators and indicators which are closely aligned with economic impact. The indicators of this type would be informed by evaluation of research council programmes

4. Chapter 4 suggests possible indicators in each category. However, those selected need to reflect the underlying differences between the disciplines supported by each council and also the balance in funding modes. For these reasons, each council needs to define indicators

which are most relevant to its strategic objectives and we are not suggesting that each council should adopt all the suggested indicators.

5. A BSC is an aid to decision making and is distinct from evaluation activities, but there are important overlaps and synergies between the two:

   - the process of articulating strategy in order to define indicators for the BSC should form the starting point for evaluations since it requires specification of the logic chains from rationale for intervention to expected outcomes and impacts
   - the evaluation programme will yield insights into causal links between research council activities and economic impact and this will inform the selection of indicators for the BSCs
   - evaluation and BSCs will utilise a common set of basic indicators and data.

6. There are important overlaps between the indicators suggested for the BSCs and those currently reported for Economic Impact Framework (EIF) purposes. There are also differences, reflecting the differing demands of a decision making tool and a reporting framework, but a great deal of the information collected for BSC purposes could feed directly into the EIF reporting mechanism.

7. The benefits in adopting the guidance in this report would be an improved ability to:

   - work within and between councils in order to build up a more comprehensive and consistent body of knowledge on the outputs and outcomes of research council investment
   - communicate to stakeholders, particularly DIUS, changes in economic impact from this investment against a baseline, in a way which is more comprehensible, insightful and consistent.

# 1: Introduction

1.1 This is the final report on work package 2 (WP2) of a study concerned with the economic impact of the research councils The original requirements for WP2 were:

- to produce a critical assessment of the methodology used, *[during WP1, the first phase of the study which assessed the economic impact of the councils though 18 case studies]* and a recommendation for a suitable, cost-effective methodology for the ongoing review of economic impact by the research councils
- it is expected that this would include recommendations on scale and quantitative and qualitative aspects of subsequent assessments. It is anticipated that each Research Council will operate its own assessment process.

1.2 For the reasons explained in the next Chapter, WP1 was not able to meet fully the requirements of the study terms of reference. More specifically, it did not produce a baseline for the economic impact of the research councils and did not, therefore, serve as a pilot on which WP2 could build. As a result, the intention for WP2 was to make recommendations for an evaluation framework for the councils which would, amongst other objectives, enable a baseline to be developed and used to assess changes in economic impact over time. A previous draft of this WP2 report sought to provide initial guidance on how the baseline might be prepared and also provided recommendations on an evaluation framework.

1.3 As part of the deliver planning process, DIUS required each council to produce a baseline to accompany their delivery plans. This overtook the work underway during WP2 and, at the request of the research councils, we have not undertaken any further work on these baselines. The remainder of WP2 was therefore subsequently refocused to extend the initial baseline approach within the context of balanced scorecards and this is the subject of the current report.

1.4 This report provides guidance on the implementation of scorecards in relation to the knowledge transfer and economic impact generating activities of the research councils. However, we note that scorecards cannot be developed in isolation from the organisation which has to implement them and their participation in articulating strategies and identifying relevant indicators is essential. This report will therefore need to be refined and developed considerably before it becomes an operational document. This requires detailed discussions within and between Research Councils

# 2: Lessons from WP1

2.1 WP1 was commissioned by Research Councils UK in April 2007 in response to the Warry Report's focus on achieving a greater understanding of economic impact resulting from the work of the Research Councils. In this light, we undertook 18 case studies of economic impact and put them in the context of existing data on impact. The cases studies have described how economic impact arises and, in some areas, also quantified impacts. The methodology is described in the WP1 report and could be readily applied to other programmes in the future. WP1 also confirmed, and generated, methodological insights concerning future impact assessment relating to the research councils. We single out four general issues for emphasis.

2.2 First, we adopted a four fold classification of the ways in which impacts arise[1]. This proved a convenient classification for analysis and reporting, but the case studies clearly revealed that there is a far from perfect correlation between impact classification and type of activity supported by the research councils. That is to say, most sorts of activities generate more than one type of impact, to at least some degree. This is especially the case with large-scale or long-running research programmes which will generally give rise to the full range of impacts. As a result, impact assessments will, in most cases, need to consider a wide range of outputs and impacts and consequently beneficiaries.

2.3 In this context, it is worth noting that the concept of impacts considered by the current study (both WP1 and WP2) is wider than the innovation outcomes which have previously been reported to DIUS. In particular, the current study encompasses the impacts on policy and general quality of life (health, environment etc,) arising from research council activities as well as the more direct economic and commercial benefits generated by innovation. The current study is, of course, focused on impacts which can, in some sense, be attributed to the research councils. It differs in this respect from the DIUS/OSI approach to measuring the impacts of investment in the research base[2] which takes a system level approach to returns, rather than attempting to associate impacts with specific activities.

2.4 The second point is that impacts were never associated with a single project, but instead reflected expertise, knowledge and capabilities typically developed during at least a programme of research, and more often in the course of more than one programme. Impact assessments need to recognise and consider these linkages between projects and programmes, otherwise there is a danger that evaluations may overestimate the impacts of a specific programme or miss its contribution to other research. This has implications for data collection and access which are discussed below.

[1] Development of human capital – through training of graduates, PhD students and post-graduate researchers; business and commercial impacts – via knowledge transfer through collaboration, intellectual property and cluster development and inward investment; policy impacts – through production of a body of research that influences 'received wisdom' or direct responses to requests for policy inputs; and quality of life impacts – through, for example, healthcare, environmental and social welfare benefits and cultural advances.

[2] Measuring economic impacts of investment in the research base and innovation – a new framework for measurement
Office of Science and Innovation, May 2007 http://www.berr.gov.uk/files/file39754.doc

2.5 Third, as is widely recognised, there are sometimes long, and often unpredictable, time lags between research and tangible impacts such as the exploitation of intellectual property. This is perhaps the most fundamental issue faced by impact evaluators and it emphasises the importance of recording relationships between projects and programmes and associating their outputs where necessary.

2.6 Fourth, there was limited existing output data with which to work but we also encountered some problems with input (expenditure) data. While all the councils were able to provide expenditure data on their own programmes quickly and efficiently, there were some difficulties in obtaining data on cross-council initiatives funded by more than one council. This appears to reflect deficiencies in the current MIS which we understand are being remedied.

2.7 One of the aims of WP1 was to provide a descriptive baseline of economic impact, but we were unable to do so with the methodology adopted. The reasons were explained in the previous report but essentially relate to the number of case studies[3] and the challenges with extrapolation on this basis. We estimate that the 18 case studies accounted for somewhat less than 2% of total current research council spend and this is insufficient for extrapolation to the total portfolio of projects. It would obviously be possible to revisit the same cases in the future, but it is not clear what useful information this would provide in terms of assessing changes in impact over time.

2.8 The case study approach also has a number of other drawbacks. First, the cases were selected carefully to:

- reflect the broad division of spend between research programmes, institutes and post graduate training
- fill gaps where there had been no, or few, evaluations previously
- encompass a broad range of funding modes and activities, including some cross-council programmes.

2.9 However, given the number of cases studies, it was not possible to use additional criteria in selection. In particular, they were not selected to represent characteristics in the total portfolio of projects which, a priori, might be expected to be associated with impact (high or otherwise). A large sample selected on this basis might have enabled conclusions about the characteristics of the total portfolio to have been drawn and, therefore, case study impacts to be extrapolated. However, this would have been highly ambitious task and would have required very substantial resources and additional data on the portfolio to have been done in a robust fashion.

2.10 The second point is that the resources devoted to the case studies were limited and most explore a restricted range of impacts in depth rather than trying to capture all outputs and impacts. As a result, they will tend to underestimate the extent of the impacts, which again limits the scope for extrapolation.

[3] Our original proposal estimated that 80 case studies or mini-evaluations were appropriate, although we recognised the logistical challenges in undertaking this many studies in such a short period.

2.11 Third, and this relates to the time lag issue mentioned above, the cases studies were funded over a roughly similar period of time, but the extent to which they drew on previous research, and the extent to which impacts will have arisen during the case study period, varied. As a result they are effectively dealing with different timescales which also complicates definition of a baseline.

2.12 Partly as a result of these challenges, Research Councils were asked by DIUS to prepare snapshots of baselines of current metrics relating to outputs and (where possible) impact, which form a context for the outcomes of Council delivery plans. In the next Chapter we set out how these baselines might be translated into a longer-term means of assessing impact, particularly through the concept of scorecards.

# 3: Balanced scorecards

## Background

3.1 Balanced Scorecards (BSCs) originated from work undertaken by Kaplan and Norton[4]. The underlying concept is that an organisation needs to consider its performance from more than one 'perspective' and to measure its performance in each of these perspectives. In particular, the BSC can help to ensure that commercial organisations devote appropriate attention to longer-term (and difficult to quantify) indicators alongside shorter term financial performance measures. The rationale for considering BSCs in the context of the research councils is essentially:

- most, if not all, of the councils' objectives are difficult to capture in easily quantifiable indicators
- most councils have adopted elements of a BSC approach to decision making or at least analogous processes
- a scorecard approach is believed to offer the most effective approach to establishing a current snapshot of the economic impact of the work of research councils (what we might loosely term a 'baseline') and building up a more comprehensive understanding of economic impact over time..

3.2 The original BSC formulations, which were primarily targeted at businesses, suggested four perspectives:

- *financial,* focusing on costs, revenues and profitability
- *customer,* the relationships of a business to its customers, and especially the value proposition which it offers
- *internal processes*, which could include a wide range of considerations such as innovation, efficiency and impact on the environment
- *learning and growth*, which includes underlying competencies of employees but also the organisation's culture.

3.3 BSCs have subsequently been adopted by many organisations from the public and voluntary, as well as the private, sectors. Concepts and operation have also developed and the number of perspectives is often extended beyond the four original quadrants often with, as would be expected, less emphasis placed on the financial perspective by public sector users.

3.4 This report is only concerned with that component of the BSC which relates to knowledge transfer and economic impact generated by research council activities. It is outside its scope to recommend a complete BSC, but we would emphasise the following:

[4] Kaplan, RS and Norton, DP, (1992) *Measures that drive performance,* Harvard Business Review, February. The same authors published several subsequent papers developing the concept and approach.

- the full scorecard must include other perspectives. It is for the research councils, and their stakeholders, to define these, but at present, the councils report under a number of headings including: 'health of the discipline'; individual strategic objectives; and knowledge transfer/exploitation. Progress against these other aims needs to be considered (balanced) alongside knowledge transfer and nothing in this report is intended to imply that knowledge transfer should be the sole driver of decision making or performance evaluation

- councils will need to specify the linkages between the measures used in whatever other perspectives are adopted with the knowledge transfer component of the scorecard. An obvious example is PhD students, which both contribute to the health of the discipline and more directly to economic impacts

3.5 There are also some general principles to which the BSC (and its components) will need to adhere. First, and most obviously, it needs to be linked to strategic objectives. The BSC is not a mechanism for devising strategy, but it should be possible to identify an organisation's strategy from the information provided in the BSC.

3.6 Second, linkages between indicators need to be specified. As was mentioned above, this is required at the overall perspectives level, but also but also between indicators within a perspective.

3.7 Third, and fairly obviously, indicators need to be meaningful and reliable. This implies they need to be selected carefully at the outset, but their validity as indicators of strategic objectives also needs to be reviewed periodically.

3.8 Fourth, the set of indictors needs to encompass, in the BSC jargon, both leading and lagging indicators. Reliance on lagging indicators has been referred to as 'driving by looking in the rear view mirror'. Leading indicators, by definition, will not encompass impacts, much less outcomes, and will instead rely heavily on inputs and outputs (in the policy evaluation sense).

3.9 Fifth, time periods need to be associated with the indicators. In the current context this means there needs to be a clear specification of the period covered by the leading indicators (especially expenditure inputs) and lagging indicators

3.10 And finally, BSCs are, in practice, applied at various levels, and by different groups, within an organisation. The top level scorecard needs to be cascaded down within an organisation and the indicators collected may well differ at each level. This issue is considered below in relation to the knowledge transfer component of the BSC. However, there will also be internal organisational issues for the councils to decide on and these are not discussed.

## Baselines in the current delivery plans

3.11 All councils prepared economic impact baselines to accompany the delivery plans submitted to DIUS. As was mentioned above, one of the aims of this report is to suggest how these baselines night be developed and extended within the framework of a BSC. Our detailed recommendations are presented in the next Chapter, but it is worth noting at this stage that they imply quite significant differences from the existing baselines. This is not intended as a criticism of the current documents which were produced in a very short time period but,

perhaps most important, they are not explicitly integrated with the delivery plans and, in part, as a result:

- they provide a partial coverage of planned council activities which are likely to generate economic impact. (There is also a partial coverage of activities which have already generated impacts but, in the absence of evaluation evidence on a much greater scale than currently exists this is unavoidable)
- they contain few explicit targets for knowledge transfer related inputs, outputs and outcomes. As such it will be difficult to measure progress made over the life of the delivery plan against the position established in the baseline papers.

## Outline approach to BSC

3.12 This report provides *generic* recommendations for the introduction of a BSC by the research councils. It suggests a broad range of indicators which the research councils can select from in developing their BSCs. Each council needs to decide on the specific approach it will adopt, for two main reasons. First, the essence of a BSC approach is that the organisation implementing the scorecard needs to translate strategy into objectives and targets. More specifically:

- as mentioned above KT is one component of the scorecard and needs to be considered alongside other strategic objectives. The relative weight to be placed on KT vis a vis other objectives therefore needs to be decided
- the BSC approach needs to be cascaded down within each council and the indicators customised according to varying levels of decision making.

3.13 This has potentially far-reaching implications for decision making structures and processes within the councils. It raises issues which are outwith the scope of the current study and would require a detailed review of the councils' processes which we have not undertaken.

3.14 The second point reflects the diversity between the councils (and within councils over time) in the activities they undertake. The indicators obviously need to relate meaningfully to actual activities and:

- there are underlying differences arising from the differences in disciplines; publications, for example, may represent a useful indicator of research outputs and dissemination for STEM subjects, but are less useful in relation to the arts and humanities
- the mode of funding will also influence the choice of indicators. Large scale scientific facilities will, for example, require customised indicators and, in general, a richer set of information is obtainable from council institutes than from universities in receipt of council funding
- as a practical matter, the balance between programme areas/funding types is also important. Needs for research outputs, for example, and how they are accessed, will vary between user sectors and needs to be reflected in the indicators. In simple terms

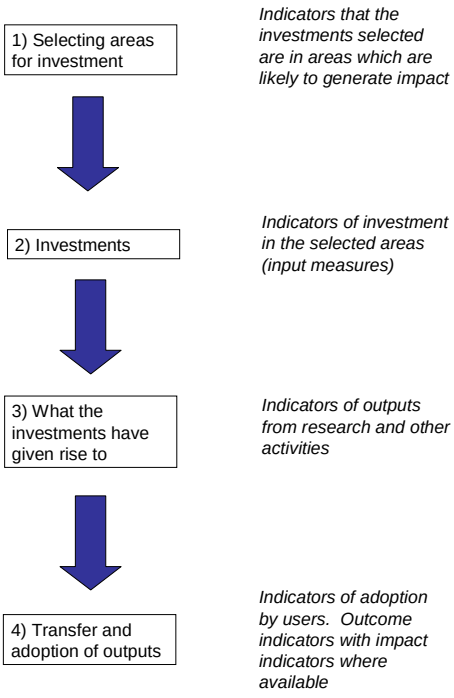
the BSCs should not devote undue effort to indicators which are only relevant to a small proportion of expenditure.

3.15 For these reasons, we are not suggesting that all the indicators should be adopted by each council. Instead, each needs to select those which are most relevant to its strategic objectives and the outcome will reflect the diversity between the councils.

3.16 The purpose of the BSC is to enable the research councils, and external stakeholders (notably DIUS) to assess progress in relation to generating economic impact (and other strategic objectives). The process must necessarily be forward looking for two main reasons. First, the difficulties of evaluating economic impact are widely recognised but the key consideration in the current context is the long time lag between commissioning and undertaking research and impacts. Most impacts which are arising now will be the result of investment decisions some time in the past, and therefore, at best, a limited guide to investment for tomorrow. Second, the evidence available on the impact of past investments is also limited in that it relates only to a tiny proportion of council investments. Indicators of the impact of past investments are not available in sufficient breadth even if there assessment was the main aim of the exercise.

3.17 For these reasons, the BSC cannot rely on impact assessments and instead needs to use leading indicators as performance measures. This means considering inputs, outputs and outcomes. The general framework we are proposing is illustrated in Figure 3-1. This is explained in more detail in the next Chapter, together with suggested indicators.

Figure 3-1: Framework for the economic impact component of the BSC



# 4: Indicators for the BSC

## Introduction

4.1 The general approach is to assemble indicators which reflect factors which are associated with achieving economic impact. Figure 3-1 summarised the proposed approach and this is explained and elaborated in this section. The components of the 'economic impact perspective' are:

- *selecting the area for investment.* The indicators here are intended to capture two main considerations, although we recognise that both are difficult to reflect adequately in simple indicators
  - the extent to which research users are involved in identifying programme areas
  - the extent to which UK users are likely to be capable of exploiting results
- *investments.* These are (long) leading indicators which reflect current expenditure by the research councils. Thus, for example, they include current commitments to collaborative R&D programmes. There is evidence to suggest that collaborative R&D has a relatively high chance of generating economic impacts. Current commitments, however, are a leading indicator because of the lags between commitment and execution and execution and adoption of results by users
- *outputs from investments.* These include, for example, results of completed project, PhD graduates and so on. They are also a leading indicator in that they reflect potential contributions to outcomes and economic impact, rather than impact itself
- *transfer and adoption of outputs.* This category would include a mix of outcome indicators and indicators which are closely aligned with economic impact. It would include, for example, direct measures of the transfer of knowledge and technologies to user organisations, for example licensing, and measures which are one step from actual impact, for example spin-outs or visitors to exhibitions generated by research funding.

4.2 Suggested indicators are described in the rest of this Chapter in a tabular format for ease of reference. They are a compromise between what would be useful and what is realistic to expect could be developed in the near future. As has already been mentioned, we are not suggesting that all indicators should be adopted by all councils. An analysis of gaps in availability and recommendations for development is presented in the next Chapter, but we deal first with some general issues.

## Robustness of the indicators

4.3 The tables below include comments on the difficulties associated with each of the proposed indicators but we would also make a number of general points. First, there are difficulties

across all councils in identifying a useful indicator of user involvement in selecting areas for investment. All councils have user involvement at various levels and there is a real possibility that this indicator would convey little meaningful information. One option would be for the councils to make some assessment of the levels of influence which users have but we feel this would also be of limited value and would introduce undue complications. In addition, decision making by users is not the aim of the research council funding framework. There is no easy solution to this and we would suggest that user involvement in decision making is monitored, but the weaknesses of the indicators are recognised when assessing scorecards.

4.4 Second, publications are suggested as one indicator of outputs from investments. We recognise that academic publications may be a poor output indicator for some councils, notably in relation to some AHRC and ESRC research, but they are an important indicator for some of the other councils.

4.5 This is an example of a more general point. Differences in disciplines, and the user sectors they relate most closely to, mean the usefulness of a given indicator will vary between councils. Publications were mentioned above, but IP exploitation, for example will be relatively more important to BBSRC and MRC than others; access to large scale facilities by business (either directly or indirectly through collaboration with HEIs) needs to be specifically reflected in STFC indicators; and councils have different responsibilities in relation to their institutes than to university departments[5].

4.6 We would note that the new end-of project reporting format provides an opportunity for councils to collect much more relevant information than previously although it will be some time before the data is available[6]. The councils, individually and collectively, are considering new indicators although they are at different stages of development. The ESRC, for example, explicitly aims to consider wider methodological issues, including indicator development, in its programme and other evaluations[7]. This illustrates the diversity between councils already referred to and also the importance of each individual council defining the framework which is most appropriate to its needs.

4.7 Finally, it may be worth emphasising that the essence of a BSC approach is that targets for all indicators are defined in advance and performance is monitored against these targets. This means that each council has the opportunity to define indicators which relate most meaningfully to their activities; thus, for example, subsets of publications, PhD outputs etc can be used.

[5] They also have access to richer data sources.
[6] This is discussed further in Chapter 5.
[7] Recent evaluation include: Molas-Gallart J and Tang P (2007) *Case Study of the ESRC Centre for Business* www.esrcsocietytoday.ac.uk/ESRCInfoCentre/Images/Case_Study_of_%20CBR_tcm6-19395.pdfResearch Rand Europe (2007) *A case study of the Future of Work programme, approach and analysis,* www.esrcsocietytoday.ac.uk/ESRCInfoCentre/Images/Case_Study_of_the_Future_of_Work_Programme_Volume_1_tcm6-19393.pdf

# BSC indicators

## *Selecting areas*

| Strategic consideration | What we are seeking to measure | Indicator | Comment |
|---|---|---|---|
| User influence over programme selection | User involvement | % of total spend determined by boards committed with user membership | There may be difficulties in defining user involvement in a way which can be measured consistently over time.<br>Each council will need to identify, in a generic sense, relevant committees/boards as part of the base lining process and changes would be measured against this baseline |
| | | % of total spend influenced by users with which research councils have strategic relationships | |
| | Partnerships TSB, RDAs, OGDs etc | % of total spend in partnership with these organisations | Proxies for user involvement |
| | Fit with:<br>government priorities<br>inward investment strategies | Descriptive only | |
| Rationale for research council intervention | What is the nature of market failure?<br>Why does this require investment by UK research councils<br>Does the answer to either of the above suggest indicators of potential impact | Descriptive with indicators where possible – relating to known additionality effects derived from evaluations | This is aiming to address basic questions of additionality. Market failure is not a sufficient condition. There also needs to be an explanation of why UK investment is required as apposed to accessing research results from other countries, e.g. UK leadership; need to develop indigenous capabilities; indigenous capacity necessary for gatekeeper role. |
| UK capacity to adopt and exploit outputs | Absrsorbtive capacity | R&D intensity<br>Qualified staff<br>Innovative activity | There needs to be some consideration of UK users' ability to exploit results. This is difficult to capture in a few indicators but ONS and CIS data will be relevant<br>This will vary significantly according to the nature of the programme; e.g. competitive capabilities will be crucial in relation to new technologies which will be incorporated in products and processes, health care management in relation to medical developments<br>This also informs risks and accompanying measures which need to be taken |

### *Investments*

| Strategic consideration | What we are seeking to measure | Indicator | Comment |
|---|---|---|---|
| Track record of award holders | Potential to actively engage in knowledge transfer | Various measures of user engagement on past projects | Data (end of project reports) difficult to interpret consistently and convert to simple indicator |
| Collaborative research | Value of projects with user engagement | Value of research council commitment in the period | Evidence suggests that collaborative research has relatively high probability of impact |
| | | % of total research council spend | |
| | | Value of user commitments in the period | |
| | | % of partners R&D spend | Relative importance to collaborator |
| | | Number | Intended to reflect spread of impacts which may not be captured adequately by spend or commitments |
| | | Specify above separately for SMEs | Hard to reach sector where market failure likely to be greatest |
| | | Number/value of above which represent first-time collaborations | Potential to establish new relationships with the research base (outside the funding programme) |
| People development | Future stream of highly qualified people | Value of funding for Post graduates awards in the year | |
| | | Specify above separately for user participation (CASE, Eng D etc) | Evaluation evidence suggests valued highly by users |
| | | Value of funding for Post doctorates | |

### *Outputs from investments*

| Strategic consideration | What we are seeking to measure | Indicator | Comment |
|---|---|---|---|
| People development | Additions to stock during the period | Post graduates: Number with first destination outside the research base | Assumes differential value to employment within and without research base |
| | | Post graduates : Number working outside the research base after 5 years | Arbitrary time period<br>Limited data (at present) |
| | | Specify above separately for user participation (CASE, Eng D etc) | Evaluation evidence suggests valued highly by users |
| | | Post doctorates: Number with next destination outside the research base | Limited data |
| | | Post doctorates : Number working outside the research base after 5 years | Arbitrary time period<br>Limited data |
| Additions to knowledge | Potential value of research outputs | Number of joint publications with users | Requires new bibliometric analysis<br>Likely to be influenced by research areas since this will influence sectors involved and their capabilities (and interests) to publish. May also be influenced by relative importance of collaborative research programmes.<br>However, neither of these factors is likely to change significantly over a delivery plan period |
| | | Citations to publications in patents | As above. In addition, there are well known differences in the propensity to patent between sectors |
| | | Quality of publications as measured by standard bibliometric indicators | This may be a relatively weak indicator in that the most influential academic publications do not necessarily have the highest impact on users (and this indicator will almost certainly be considered under health of discipline indicators). However:<br>• high academic impact is associated with wide circulation<br>• high academic impact papers will support other research with more direct impacts on users |

## *Transfer and adoption of outputs*

| **Strategic consideration** | **What we are seeking to measure** | **Indicator** | **Comment** | |
|---|---|---|---|---|
| Exploitation of IP | Licensing<br>Sale of IP | Number<br>Income raised | Value of license does not necessarily correlate with UK economic impact | Robust data is available on Institute activities but difficult to identify contribution of research council funding to exploitation by HEIs<br>See next Chapter where HEBCI survey is discussed |
| | Spin-outs | Number<br>Capitalisation<br>Turnover<br>Employment | May be lengthy time lag between spin out establishment and economic impact<br>Expensive to track over time<br>Attribution of impact to research becomes problematic the longer the time period after establishment, especially if spin-outs acquired by other businesses<br>But quantifiable outcome indicators, some of which translate directly to economic impact<br>Data problems as above | |
| | Visitors to exhibitions etc (mainly in relation to AHRC) | Number of visitors | Readily converted to economic impact although counterfactual difficult to establish | |
| Development of a capability for users | Contract/collaborative research undertaken by research council sponsored academics | Number<br>Value | Data issues as above | |
| | Consultancies (as above) | Number<br>Value | | |
| | CPD as above<br>Number<br>Value | Number<br>Value | | |
| Dissemination | User groups | Number of users involved<br>% of total spend they relate to | Difficult to define consistently | |
| | Dissemination activities (media, knowledge brokers etc) | Spend | Will need to be broken down into defined categories | |
| | Citations in user literature | Number | This will require a new set of indicators to be developed (see next Chapter) | |
| | Interactions with users | Number | From (new) end of project reports ***(NB we expect this to be especially valuable in the future and this source is discussed further in the next Chapter)*** | |

| Strategic consideration | What we are seeking to measure | Indicator | Comment |
|---|---|---|---|
| KT activities directly sponsored by the research councils | Business plan competitions | Number of participants | |
| | | Value | |
| | 'Proof of concept' | Value | |
| | Enterprise fellowships | Number of participants | |
| | | Value | |
| | KTPs | Number | |
| | | Value | |
| | | Specify separately for SMEs | |
| | KTNs | Number | |
| | | Value | |

## Selecting indicators

4.8 BSCs typically adopt between 20 and 30 indicators in an attempt to capture a wide enough range of organisational activity while at the same time making progress assessments feasible and manageable. Each council would therefore need to select a subset of those listed above. There are obvious general principles which should guide selection including: data must be available in time to track progress; it should relate to activities the councils can influence[8]; it should be comparable over time; it should be capable of recording changes in behaviour and activities; and, most important, it should reflect strategic objectives. There are some components of the tables which we believe are likely to meet these criteria, at least for some councils, and these include: the rationale for research council intervention; investments in (and outputs from) collaborative programmes and people development; and exploitation of IP[9]. However, we are not able to specify which indicators should be adopted by each council for the following reasons:

- which are the most appropriate indicators will depend on the strategic objectives of each council and the balance between areas of research, target user sectors and mode of support. These objectives are articulated, in broad terms, in the delivery plans but we have not been able during the current assignment to undertake the detailed discussions with the councils necessary to translate the delivery plans into BSC indicators

- if the councils did adopt BSCs we would expect the approach to be cascaded down through the organisations; as a minimum we think it likely that BSCs would be necessary at the level of the total portfolio (aggregate expenditure) and at major programme levels. The indicators adopted at each level would need to at least be consistent and, if possible, capable of aggregation. In addition, as indicators are cascaded down through the councils they become more important as incentives of

[8] But factors which the councils cannot influence are important contextual information for BSCs.
[9] Once again we would emphasise that these will not be the most relevant indicators for all councils.

behaviour. These factors mean that development of the indicators becomes a major organisational issue which is outside the scope of the current review. We would also argue that the councils need to be closely involved in the development of these indicators, both for the knowledge and experience they can bring but also to engender buy-in to the framework.

# 5: BSCs and evaluation

## Introduction

5.1 The main purpose of BSCs is to monitor progress towards the achievement of strategic objectives and aid decision making. They are distinct from an evaluation framework but there are important overlaps and synergies between the two. The first section of this Chapter outlines these relationships and concludes with a brief discussion of possible links between BSCs and the Economic Impact Framework (EIF) against which the research councils report to DIUS.

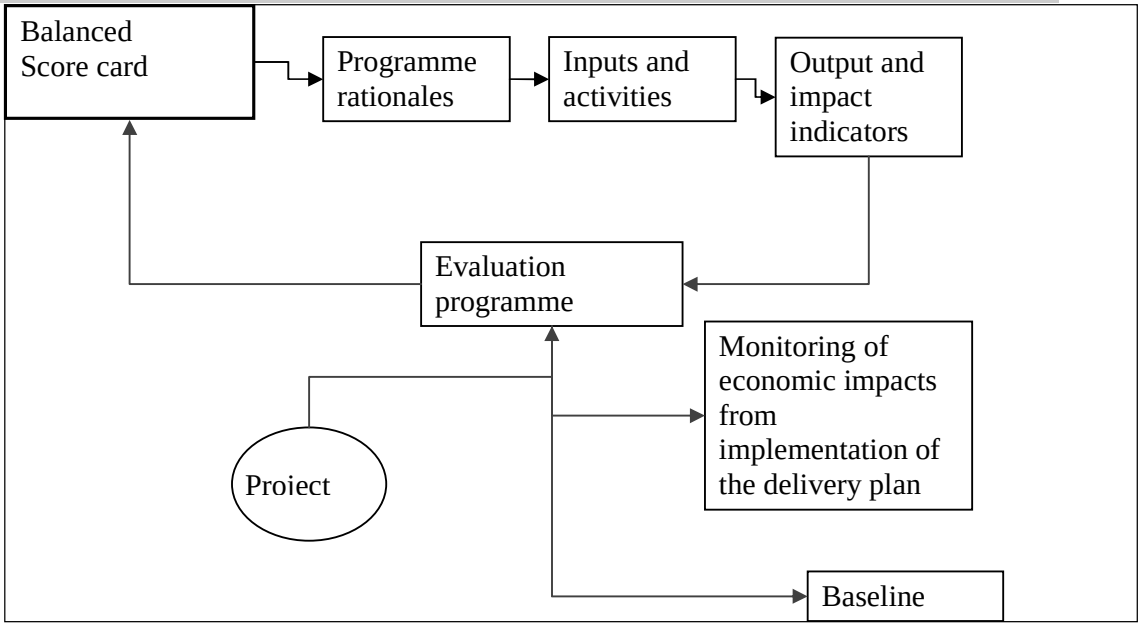
## Relationships to the evaluation framework

5.2 The previous Chapter has suggested a range of indicators which could be used in a BSC. The indicators are a mixture of: some which are fairly readily available now; some which could be developed with a minimum of additional resources; and some which are far from operational at present. However, it makes no mention of individual evaluations or case studies as an input to the BSC. This, in part, reflects the nature of BSCs which are concerned with monitoring progress whereas evaluations are often concerned with impact (economic or otherwise) estimation. The time lags inherent to research programmes means that such evaluation evidence will not be available for incorporation into the BSC; and hence the emphasis on leading indicators in the previous Chapter. More generally, evaluations are undertaken both to demonstrate impact to stakeholders and for reasons of accountability (and in the current context this means developing baselines against which progress in achieving economic impacts can be assessed) and to learn lessons in order to improve the effectiveness and efficiency of future programmes.

5.3 The evaluation framework does, however, need to be integrated with the BSC process as well as fulfil these other needs. The basic framework is presented in Figure 5-1[10]. Each of the components is explained in more detail below but the top line of boxes (beginning with decision making) refers to the strategic planning and fund allocation process. The 'evaluation programme' represents analysis, undertaken by the councils or commissioned and project data is the lowest level of data collection and in the main corresponds to the current end of project reports. The 'monitoring' and 'baseline' boxes represent regular reporting to external stakeholders. The key aspect of is that the decision making process needs to specify the impact related rationales for programmes and these are used to identify indicators and other information to be collected for evaluation and monitoring processes.

[10] This discussion is an abbreviated version of 'the evaluation framework' which was provided in previous draft reports.

Figure 5-1: Basic framework




5.4 The framework needs to provide a methodology that enables the research councils to identify the impacts that they are having and the reasons why these impacts are being generated. This is not simply so that the research councils can prove to funders the impact that public funds are having on the science and innovation agenda. It is also to allow the research councils to make informed decisions about their future investments and activities that take on board the lessons learnt from the impact of previous investments and activities. As a result, one of the requirements of the framework is to provide a means to assess impacts and the lessons learnt from these and to incorporate these through a management tool that can combine the findings with other elements such as internal processes, capabilities and foresight. This management tool can then be used to inform decisions about future investments and activities.

5.5 Figure 5-2 brings together the components of the evaluation framework. The solid lines indicate a direct contribution from one component to another. Dotted lines indicate a methodological feedback. This for, example, some of the ad hoc studies may identify methodological issues which should inform the content of other studies (and monitoring processes). There would be four core components of the evaluation programme:

a. ad hoc studies and impact assessments of specific 'themes' which cut across programmes (and possibly research councils) These studies would themselves provide impact assessments, but also inform other studies by providing data and analysis which can feed into other evaluations. The PhD study now under consideration is an illustration of what we have in mind. This is expected to provide valuable information on the career paths of PhDs and therefore the economic impact of students supported by the research councils. However, this information could also feed into other studies, for example of research programmes, which are producing skilled people as a joint product

b. ad hoc studies of specific programmes, for example the recent ESRC evaluations of research programmes. Research councils already perform systematic programme evaluations but

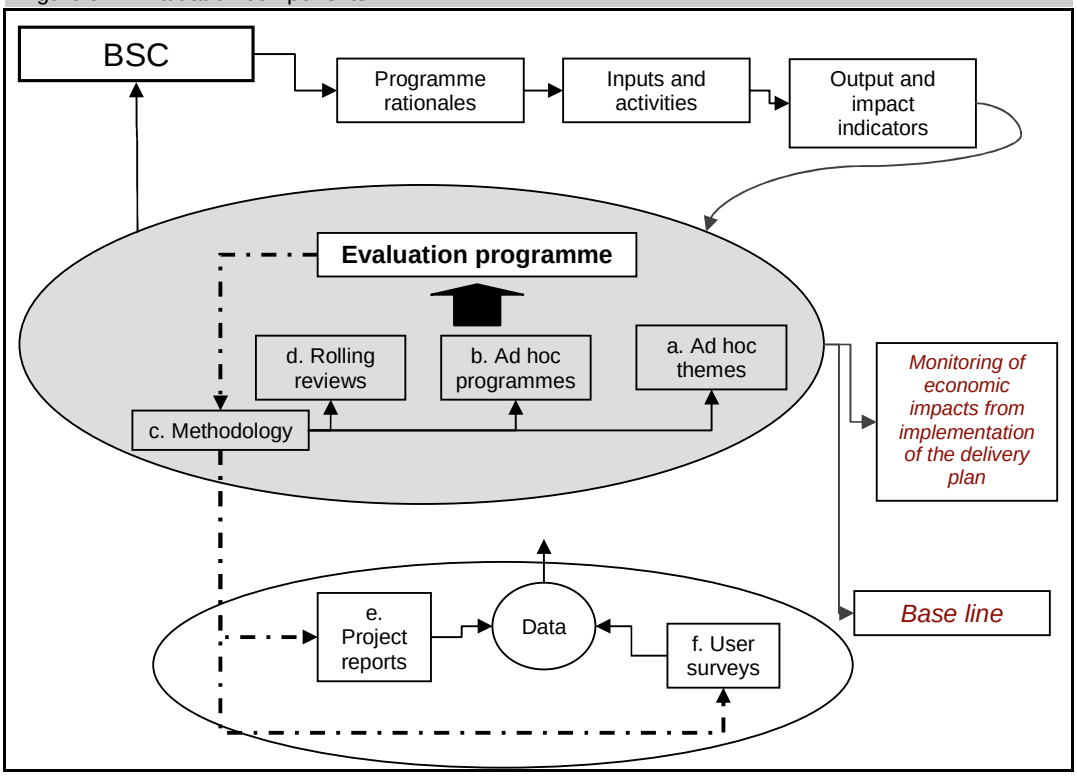
some focus on research outputs rather than impacts. These could be extended to gather additional data relevant to the assessment of economic impact.

c. ad hoc studies of methodological issues relating to impact assessment of the research councils, for example, identifying key characteristics of activities which are associated with impact, developing the empirical understanding of impact channels and converting from gross to net outputs. Note that these could be stand alone studies, but (c) and (d) should also consider generic methodological issues where appropriate

d. rolling evaluation programmes, for example subject reviews or institute assessments. In the past, such reviews have also tended to focus on research quality and efficiency, but impact assessment is starting to feature more prominently in at least some cases and could be given a higher priority.

5.6 End of project reports (e) and user surveys (f) are discussed below.

Figure 5-2: Evaluation components

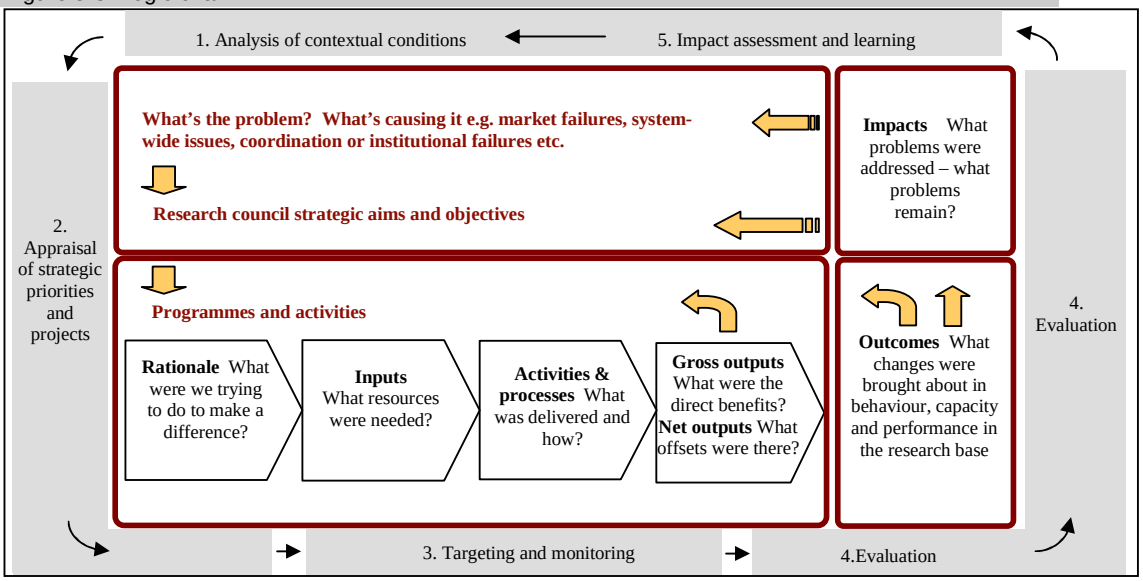



5.7 In summary, the key links between the evaluation framework and the BSC are:

- the process of articulating strategy in order to define indicators for the BSC will form the starting point for evaluations. Formally, we have in mind specification of logic chains as illustrated in Figure 5-3
- the evaluation programme will yield insights into causal links between research council activities and economic impact and this will inform the selection of indicators for the BSCs

- they will utilise a common set of basic indicators and data. Some of this already exists and some needs further development and the latter is discussed in the next section.

Figure 5-3: Logic chain




### *Key gaps*

5.8 We believe that there are deficiencies in four key areas which would need to be addressed to get the most value from the evaluation framework.

*HEBCI data*

5.9 The first, concerns information on outputs and outcomes which are generated by council sponsored researchers in the HEIs. This includes: IP exploitation; consultancy, CPD and contract and collaborative research funded directly by partners[11]. Direct information on such activities is good in relation to council institutes because of the management and funding relationships with the councils. However, the only comprehensive data on HEIs is that collected by the HEBCI survey, which is now a well established source of information on knowledge transfer from the sector. Unfortunately, it is not possible to identify transfers and exploitation arising from research council support or even to associate such activities with council funding. This will always be a complex issue because exploitation will often not be associated with a specific grant[12] and there is a complex attribution issue which arise because of the involvement of university commercialisation officers. However, much university exploitation would not be possible without council funding and these activities need to be reflected in the scorecard.

5.10 We understand that there have been discussions with HEFCE as to whether the response to the survey could be broken down by broad discipline. This would provide useful information

[11] Again, we would note that these indicators are, in general, more relevant to the STEM subjects than the arts, humanities and social sciences.
[12] The new end of project reporting system will provide additional information in this respect (see below)

since it would facilitate research council funded activities to be mapped on to commercial outputs. However, we understand that this may not happen because of the extra administrative burden that might be imposed on HEIs. We would urge the HE funding councils to reconsider their stance on this issue. We doubt that there would be a substantial addition burden since the data is probably built up on a departmental basis within institutions. If this is not possible then we recommend that the research councils undertake an analysis, using HESA data, of the relative importance of their funding to individual HEIs' research income. Where this accounts for a substantial share then the research councils can legitimately claim to be supporting most of the HEBCI outputs in relation to intellectual property exploitation. The BBSRC has commissioned work on commercialisation by those departments which account for the majority of its (university) funding and preliminary discussions have been held with UNICO to explore whether there is anything distinctive about spin-outs arising from council sponsored research. Both could inform analysis of the HEBCI data and other councils might consider whether similar studies are required.

*Dissemination of results*

5.11 Awareness of research outputs is a necessary condition for use, but there are very few indicators which adequately capture performance. The new end of project reports could be valuable in this respect, but there will be difficulties in aggregating across individual researchers and across programmes. We believe that a structured monitoring of relevant (non-academic) publications could, however, provide robust indicators. What we have in mind is that each council would identify a relevant set of journals and other media and these would be monitored over the evaluation period to identify citations to sponsored research and sponsored researchers. It should be possible to develop basic impact factors, perhaps based on circulation, in order to derive useful metrics. Some of these might be common across councils; Hansard, for example might be appropriate to several if not all councils.

*User satisfaction*

5.12 The indicators above are focused on numerical and financial data, but the quality users ascribe to interactions is also a valid measure of performance. The recently completed user-satisfaction survey has provided information at an aggregate level which was cited by councils in their baseline reports. There is also scope to collect information from users in relation to specific programmes ands activities and this is discussed further below.

*International benchmarking*

5.13 The indicators suggested in the previous Chapter are essentially concerned with changes in councils' performance, but benchmarking against international experience could provide additional insights. The main difficulty is establishing sensible benchmarks in an area as complex as knowledge transfer. This is in part a data issue, in that there is limited information on what is being achieved in other countries. However, we believe the conceptual difficulties are more important; specifically, the differences between countries research and innovation systems means that numerical comparisons are fraught with danger. To illustrate, AUTM provides quite comprehensive data on commercialisation by US universities but differences in; for example, funding sources, research systems and user

behaviour make comparisons very difficult. We do, however, believe there is more scope for specific studies of transfer and commercialisation which are likely to provide more robust insights into outputs and outcomes, and perhaps also lessons for the future. We understand that RCUK is also exploring this topic with UNICO in relation to spin outs and there may be analogous opportunities in other areas.

*End of project indicators*

5.14 We are aware that the councils are committed to reducing the costs of end-of-project peer review, but our understanding is that the major costs arose from grant holder time to prepare reports, rather than peer review per se. Some councils have decided to end peer review of end of project outputs but some are still undecided in this respect. It is important that this data is seen to be robust and we recommend

- peer review should continue, quality and novelty are important characteristics of projects with potentially high impact. Peer reviewers may also be able to assess validity of 'knowledge transfer' claims
- verification should take place through in-depth 'dip stick' testing of claims, whether or not peer review continues

5.15 As was mentioned above, data will be collected for a much longer period than at present. For most research councils this is 3 months. We recommend that the report be 'left open' indefinitely after project completion. There is an issue as to whether grant holders will continue to provide meaningful information some time after the project is completed, but those that are willing to do so should have the opportunity. However:

- a minimum period will need to be set during which grant holders are *required* to add to the report; we suggest five years
- the usefulness of the information collected should be monitored.

5.16 We recommend that the information is publicly available and this will provide an incentive to record outputs.

5.17 Our recommendations for the common indicators are presented in Table 5-1. These are potentially an important component of the baseline indicators (see the table *transfer and adoption of outputs* in Chapter 4).

Table 5-1: Indicators

| Topic | Information | Comment |
|---|---|---|
| Links to previous funding | Same research council | |
| | Other research council | |
| | Other funders | |
| Follow-on funding | Research council grant | |
| | Collaborative research | |
| | Other funders | Charities, user |

| Topic | Information | Comment |
|---|---|---|
| IP exploitation | Chain from disclosure to patent | |
| | Licensing income (royalties and sales) and location of licensee | |
| | Spin-outs | |
| | Investment | |
| | Turnover | |
| | Employment | |
| | Location | |
| Income from activities in which research results have played an important role | Consultancy | |
| | CPD | |
| | Contract research | |
| Dissemination of research outputs | Academic publications | (grant holders should also be asked for descriptive information for major 'events' where known. For example whether there is a business sector focus to any conferences, numbers attending conferences, numbers attending exhibitions etc)<br>Networks - grant holders should list organisations where (the grant holder perceives) there has been significant contact to discuss research results. This would include policy related contacts as well as direct research users |
| | Other publications e.g. evidence to select committees | |
| | Conferences | |
| | Exhibitions | |

## Relationship of the BSCs to the EIF

5.18 There is an obvious overlap between the proposed BSCs and the recently revised Outputs and Economic Impact Frameworks but also important differences. The differences arise because they are intended to serve different purposes; the BSC is a decision making tool and the EIF a reporting framework. These purposes are not incompatible but they result is quite significant differences including:

- although there are overlaps in proposed indicators there are differences in timing (in some cases). More specifically the EIF is reporting some data on outputs which may have been generated by investments over a lengthy previous period of time. The BSC is instead only concerned with current activities
- related to this point the EIF reports the results of specific evaluations in some cases

- although we believe it is essential that the research councils themselves decide on which indicators to include in their BSCs it is likely that rather more will be required than are included in the EIF.

5.19 The implication is that the BSC indicators would need to be supplemented in various ways to meet the needs of the EIF. However, a great deal of the information collected for the BSCs could feed directly into the EIF reporting mechanism.

# 6: Conclusion and next steps

6.1 This report has done two things:

- first it has provided guidance on the implementation of balanced scorecards (BSCs) in relation to the knowledge transfer and economic impact generating activities of the councils. This guidance focuses on a range of indicators, of four types, which would be adapted by individual councils to provide the most appropriate set of indicators against which progress on economic impact could be measured as part of an overall approach to strategic decision making
- second it has linked the BSC to an evaluation framework which could be used to generate some of the data required to populate the outcome-focused indicators which form part of this framework.

6.2 We acknowledge that much of what is proposed in this report has been adopted to some extent by one or more of the councils and in this sense it reflects an amalgam of best practice across the councils. However, we do not thinks any councils have adopted such an approach in its totality. The benefits in adopting the guidance in this report would be an improved ability to:

- work between councils in order to build up a more comprehensive and consistent body of knowledge on the outputs and outcomes of research council investment
- communicate to stakeholders, particularly DIUS, changes in economic impact from this investment against a baseline, in a way which is more comprehensible, insightful and consistent.

6.3 If this guidance is accepted, then we believe the next steps should be for:

- each council to identify the set of indicators which are most appropriate for them given their remit, disciplines and delivery plans
- KTEIG to initiate a discussion with DIUS on how the BSC and evaluation framework can be put into practice in the most effective way
- each council to ensure that their existing programmes of data collection and evaluation in accordance with their application of the framework
- KTEIG to ensure that cross-council initiatives design to improve MIS are consistent with the framework.