RESEARCH IMPACT: A CROSS SECTOR REVIEW

LITERATURE REVIEW

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[1] See Nutley, SM, Percy-Smith, J and Solesbury, W (2003) *Models of research impact: a cross sector review of literature and practice* (Learning and Skills Development Agency)

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LITERATURE REVIEW

1. INTRODUCTION.

Objectives.

This paper reports the results of a literature review conducted as part of a wider project entitled 'Models of Research Impact: a cross-sector review'. This project was undertaken on behalf of the Learning and Skills Development Agency (LSDA) by a consortium of researchers from the ESRC UK Centre for Evidence Based Policy and Practice, Queen Mary, University of London; the Policy Research Institute, Leeds Metropolitan University; and the Research Unit for Research Utilisation, University of St Andrews[2].

In this paper we present the findings from one component of that project: a cross-sector literature review of the research impact field. The paper provides an overview of the literature on approaches to enhancing research use from the education, healthcare, social care and criminal justice sectors.

The objectives of the literature review were three-fold:

- to provide an overview of the conceptual frameworks and models which guide research impact thinking and practice
- to provide evidence on the success of different practices which aim to enhance research impact
- to examine how effectiveness of research impact is best assessed.

Scope.

The literature searched was restricted to dates from 1990 onwards. This reflects both the scope of the project and previous work by the Research Unit for Research Utilisation (RURU) which suggested that returns on searches prior to this date would be limited. Searches were also confined to English language papers. The focus of the review was UK papers but an international perspective was taken when searching.

Given the vast scale of potentially relevant studies, the scope of the health sector literature searched was restricted[3]. Empirical studies in the health sector were confined to:

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[2] The results of the overall project are reported in Nutley, SM, Percy-Smith J and Solesbury, W (2003) *Models of research impact: a cross sector review of literature and practice* (Learning and Skills Development Agency).

[3] For example, the EPOC (Effective Practice and Organisation of Care) database, which lists studies of interventions designed to promote effective practice of which many are concerned with improving research use, contains over 1000 entries. The latter reflect rigorous selection procedures and in practice the number of studies potentially relevant to this review within the healthcare field is likely to be several times this figure.

- relevant reviews and overviews of interventions to enhance research impact.
  For some reviews, it was not always clear whether the interventions researched in individual studies were specifically concerned with enhancing the impact of research: for example, a review of the implementation of guidelines was unable to distinguish in which studies the guidelines were research-based (Thomas, 1999). Where there was ambiguity, reviews were included if they considered interventions which have regularly been used to enhance research impact.

- evaluations of four large-scale or multi-site initiatives.
  We searched for studies of the following key initiatives, identified by previous RURU searches:
  - North Thames Purchaser-Led Implementation Projects Programme
  - PACE - Promoting Action on Clinical Effectiveness
  - *facts* - Framework for Appropriate Care Throughout Sheffield
  - Front-Line Evidence-Based Medicine Project.

Methods.

Search strategy.

RURU is developing a database of papers relevant to evidence-based policy and practice implementation issues. The original results of searches conducted for this database were scanned for relevance to this review. These searches drew on a range of sources:

- general databases: Web of Science, BIDS (via Ingenta), Expanded Academic ASAP International, Science Direct, PAIS, SIGLE (for grey literature)
- education: ERIC, Education-Line
- health: HMIC - King's Fund and Department of Health
- social care: Caredata, Social Care Group
- criminal justice: Criminal Justice Abstracts
- ZetocAlert alerting service
- personal contacts.

Additional searches conducted specifically for this review involved[4]:

- database searches of the UK Network for Evidence Based Policy and Practice bibliography and the NCJRS database (criminal justice)
- the REGARD research register
- MEDLINE searches restricted to studies indexed as "review" or "meta-analysis"
- reference lists from healthcare reviews and overviews
- searches for studies of key healthcare research impact initiatives on MEDLINE and the web
- extensive searches of web sites of key organisations and local and national government plus onward links.

[4] The EPOC database is a key source of literature relevant to implementing research-based practice in healthcare. The database was searched for this review, but as it only provides basic citation details without abstracts, we were unable to assess the relevance of references retrieved. As noted below, limits on resources prevented us obtaining the full texts of papers without abstracts.

General search terms relating to research impact were used for all database searches. These are listed at Appendix I. Searches aimed to be as comprehensive as possible, but the research impact field is poorly indexed and difficult to search. Thus, while searches were thorough and extensive, they are unlikely to have been exhaustive.

Refined search terms were developed from reading full texts of papers selected for the review (see Appendix I). Further searches using these refined terms were conducted on a limited sample of core databases to assess whether results were significantly improved. Approximately 1,750 references were retrieved from these searches. Initial selection criteria were applied to a sample of 500 of these and the results suggest that relevancy was slightly lower for references retrieved using the refined search terms. This probably reflects the poorly indexed nature of the research impact field.

Selecting papers and data extraction.

Around 5, 800 references were retrieved by the searches[5]. Titles and abstracts were scanned against broad initial selection criteria (see Appendix II). Approximately 4, 050 papers were rejected at this stage.

For 950 references retrieved, no abstract was available, making it impossible to assess relevance. Limits on resources meant we were unable to retrieve full texts of all these papers. However, a sample of 24 full texts were obtained to assess whether these papers differed substantially in nature and content. Inevitably this is too small a sample to be representative. However, 4 of the 24 would have been selected for the review on the basis of their abstracts and/or full texts: 3 as background papers and 1 as a theory paper. None of the 24 examined differed in any substantive way from those retrieved in general.

Full texts of the remaining 800 papers were applied for and 750 were obtained in time for assessment for the review. These were scanned for inclusion against the in-depth selection criteria detailed in Appendix II. Where there were doubts about including a paper, a second reviewer made an independent assessment. 341 papers met the criteria and the remainder were excluded.

A mapping exercise was conducted for all included empirical papers. Data were extracted using the form at Appendix III. The results of this exercise are presented in section 2.

In-depth data extraction was then carried out for all empirical papers identified in the mapping exercise using more detailed forms (see Appendix III). All empirical studies were quality assessed using the criteria at Appendix IV. A sample of papers were quality assessed by three reviewers independently to test the reliability of these criteria. Good agreement was found in all cases.

Synthesis.

Data from empirical papers were synthesised thematically. Interventions studied were analysed in terms of their content and the theoretical frameworks in which they were implicitly or explicitly embedded. This identified the mechanisms which seemed to

[5] In this section, some figures for papers retrieved have been rounded to the nearest 10.

underpin interventions. Interventions were grouped according to these mechanisms. Data on effectiveness and on barriers to and enablers of this effectiveness were then synthesised within each grouping.

16 papers had inadequate details of methodology to allow quality assessment and were initially excluded from the synthesis. Their findings were then checked against those of the overall synthesis. Only two papers, both describing the same intervention, were considered to add substantially to the findings of the review. Their results were included in the synthesis with a caveat as to the difficulties of assessing the robustness of the evidence given.

2. OVERVIEW OF THE LITERATURE

This section maps out the results of the literature searches. It describes the nature and quantity of papers retrieved and how these have been included in the review.

Of the 341 full texts which met the selection criteria:

- 155 were conceptual papers:
  - 72 examined the development of evidence-based practice across a particular sector or sub-sector area, for example social care or mental health services
  - 36 explored evidence-based practice in relation to specific theoretical frameworks
  - 32 developed models for implementing research-based practice
  - 15 considered theories and models of research utilisation.

- 2 were "methodological papers". These were papers which examined empirically the definition and measurement of research impact. One theory paper also examined methodological issues. These papers supported the discussion of what defines and measures research impact in section 3.

- 59 were classed as "background papers". These were papers which described particular interventions to enhance research impact without evaluating them.

- 125 were classed as empirical papers. "Empirical" papers were defined as those which reported some form of outcome data as follows:
  - measures of research impact, such as a change in awareness, knowledge or practice
  - details of specific enablers of or barriers to enhancing research impact.

Empirical papers provided the core data for evidence of effectiveness of different practices to enhance research impact. The nature of these papers is examined in detail below.

Empirical papers.

A "mapping exercise" was conducted for all empirical papers retrieved. This aimed to give some indication of the likely nature and extent of evidence on effective research impact across the four sectors examined: education, health, criminal justice and social care. As already noted, our searches were extensive if not comprehensive and the results detailed below can probably be seen as representative.

In 15 cases, data from the same study were reported in more than one paper[6].

Just over half were located on electronic databases. All those identified from reference lists - a further quarter - were review papers from the health sector (see Methods).

Nearly three-quarters of papers were journal articles, and one-fifth were reports. The remainder were Cochrane reviews, books or book chapters and conference papers. Just

[6] This excludes single studies within systematic reviews but includes updated versions of these reviews.

under a half included some form of conceptual discussion in which empirical results were embedded. Notably, considerably fewer than half of the health papers reviewed had a conceptual element.

Table 1 shows papers retrieved by sector area.

Table 1: Papers retrieved by sector.

Sector	**Number (N)**	**Percentage (%)**
Health	74	60%
Education	16	13%
Social care	18	14%
Criminal justice	8	7%
Cross-sector	9	7%
Total	125	100%

NB. Totals do not add to 100% due to rounding.

There were some important differences between papers according to sector, which reflected the scope of this review and the search methods used.

The proportion of health papers retrieved was large, especially given that we were concerned to locate only relevant reviews and studies of a few specific initiatives. This is a function of the development of the research impact field in the health sector relative to other sectors. About half were systematic reviews of studies which examined the effectiveness of research impact interventions[7]. A further 10 were meta-analyses or overviews of relevant systematic reviews. Most of the remainder were non-systematic reviews. Only two papers reviewed studies which examined barriers to and enablers of research impact. 8 were single study outcome and/or process evaluations of specific initiatives to improve research-based practice.

Of papers from the education, criminal justice and social care sectors:

- 26 were outcome and/or process evaluations of interventions which aimed to enhance research impact
- 30 were studies of the use of research.

A further 2 were non-systematic reviews of such studies.

For synthesis, empirical papers were grouped into 3 categories:

1. Systematic and non-systematic reviews, meta-analyses and overviews from the healthcare field and cross-sectoral overviews
2. Single study outcome and/or process evaluations of interventions to enhance research impact
3. Studies of research use.

The characteristics of these groupings are considered below.

[7] Systematic reviews were defined as those with explicit and comprehensive search strategies and explicit selection criteria.

1. Healthcare and other reviews - 67 papers.
   Studies included in these reviews derived from a wide range of countries although North American studies tended to predominate in most. They also spanned diverse healthcare settings although one-sixth examined primary care alone. For the majority of systematic reviews and meta-analyses, only rigorous controlled trials were included, and in 8 reviews studies were restricted to randomised controlled trials (RCTs). A wide range of interventions were studied and these are listed at Appendix V. 36 papers considered single intervention types. The remainder considered the effectiveness of diverse types of intervention in relation to behaviours targeted, healthcare setting or specific health issues, or else were general overviews of the field. In all cases, interventions studied aimed to change the behaviour of healthcare practitioners. There were also 2 reviews of barriers to and enablers of research utilisation.

2. Single evaluation studies - 26 papers.
   These included 8 papers from the healthcare sector, 4 from criminal justice, 7 from social care and 7 from education. Single studies used a range of both qualitative and quantitative methods and were often mixed method. Again, a wide range of interventions were studied (see Appendix V). While most examined research impact and use in the practice community, there were a few studies of the policy arena.

3. Research use studies - 30 papers.
   The majority of these considered the use of research by social care, criminal justice or education practitioners or policy makers, most often using questionnaire surveys. The remainder were case studies tracing the use of research through policy or practice development.

The two reviews from outwith the healthcare sector, one of which also contained its own empirical study of research use, contributed evidence to both of the last two groups.

3. PRACTICES FOR EFFECTIVE RESEARCH IMPACT.

This section presents the synthesis of data on the effectiveness of research impact practices from empirical studies included in this review. It first discusses how research impact was defined and assessed within the different studies reviewed. It goes on to present evidence of effectiveness of different practices and the theoretical frameworks in which they are embedded. Generic barriers to research impact are then presented. The conclusion draws together findings about what works in the research impact field and presents some key factors for success.

Defining and assessing research impact.

Diverse models have attempted to explicate "research use" (see e.g. Nutley et al., 2001). A key distinction can be made between "conceptual" use, which brings about changes in levels of understanding, knowledge and attitude, and "instrumental", or direct, use, which results in changes in practice and policy making (Huberman, 1992). Research impact forms a continuum, from raising awareness of findings, through knowledge and understanding of their implications, to changes in behaviour. Strategies to enhance research impact may address any point on this continuum. The aim of research impact strategies will determine how their effectiveness is measured.

The empirical studies examined in this review considered a wide range of forms of research impact:

- changes in access to research
- changes in the extent to which research is considered, referred to or read
- citation in documents
- changes in knowledge and understanding
- changes in attitudes and beliefs
- changes in behaviour.

Some studies also examined impact using proxy measures which compared final outcomes, such as patient health, with those predicted by the research.

Methods used to assess these impacts were similarly diverse and derived both subjective and objective measures of impact. The validity of such measures must be defined within the terms of each study but a review by Adams et al. (1999) found that self-report measures of practice significantly overestimated actual behaviour.

Reviews from the healthcare literature almost invariably examined objective measures of the process or outcomes of care. These require demanding levels of impact to be demonstrated and do not address the extent of impact at the "conceptual" end of the spectrum. Single evaluation studies used a range of measures and methods, both qualitative and quantitative, to examine different kinds of research-induced change. Studies of research use most often relied on self-report data from surveys. Of all the papers examined, however, it was rare for issues of defining and measuring research impact to be directly addressed or theorised.

The following synthesis draws on evidence from healthcare and cross-sectoral reviews and single evaluation studies. No study method is excluded, but mention is made of the

likely quality of the evidence presented. Findings from studies examining research use in policy or practice are included to support the synthesis only when this evidence is robust.

Practices to enhance impact: evidence and theory.

This section presents evidence of the effectiveness of different interventions to enhance research impact and of specific factors which may help or hinder their success. It also examines the theoretical frameworks which help make sense of the contexts of research impact and guide the development of interventions. Interventions[8] have been grouped according to the mechanisms through which they aim to enhance research impact, as follows:

- Dissemination - provision and re-presentation of research findings, both written and oral, including guidelines
- Educational interventions - increasing knowledge and understanding of research
- Social influence - using the influence of others to inform and persuade, for example opinion leaders
- Collaborations between researchers and users - including the institutional co-location of researchers with practitioners and policy makers, and interventions which enable practitioners to "test out" research findings in local contexts
- Incentives - financial incentives to change behaviour and research funding practices to encourage impact activities
- Reinforcement of behaviour, such as through audit and feedback and reminders
- Facilitation - interventions which provide practical, technical and financial assistance to support research-based change
- Multifaceted interventions deploying two or more of the above practices.

As Appendix V shows, some interventions were only considered within the healthcare literature. The reverse was true for others, notably collaborative approaches. Background papers which described but did not evaluate interventions give an indication of the range and nature of research impact activity across the four sectors. Approaches to enhancing research impact described in the background papers generally duplicated or reflected those practices identified in empirical papers and fitted well into the categorisations developed above. Appendix V notes some additional types of practice within these categories which were identified in the background papers. Notably, some background papers described collaborative approaches undertaken within the healthcare field[9]. However, the small number of papers from the outwith healthcare field makes it difficult to report reliably on any significant differences in research impact activities between the sectors studied.

[8] The full list of interventions considered in evaluative studies and reviews is at Appendix V.

[9] As searches and selection criteria for healthcare studies were focused primarily on reviews, a large number of single studies from the healthcare field were rejected. While the practices these considered would likely have been picked up by wider reviews, there may have been others which have not been identified. Unfortunately, trawling through the large number of such studies was beyond the scope of this review.

Dissemination.

Dissemination is the circulation and/or re-presentation of research findings, orally or in a written format. It involves the provision of information on research, in more or less tailored form, and includes guidelines and guidance.

Evidence of effectiveness.

Two forms of research dissemination were identified:

1. Passive dissemination: unplanned, untargeted, ad hoc forms of communication, such as publication in academic journals.

   No evidence was found either way as to the effectiveness of passive dissemination of research. Research use studies found only a minority of practitioners read or referred to research findings and suggest some barriers which inhibit the impact of passive dissemination:
   - lack of access to research findings, including poor or distant library facilities and limited circulation within organisations
   - lack of time to access or read research
   - lack of skills to interpret research findings
   - sheer volume of research literature
   - scope and presentation of findings not being "user-friendly".

   Studies found consistently that users wanted findings to be provided in clear, jargon-free language, in summary form, and drawing out the key implications for users.

2. Active dissemination: tailoring research findings to a target audience and a dynamic flow of information from the source.

   Research use studies suggest it is important to translate research into formats tailored to potential consumers. Lomas (1991) found that the provision of consensus recommendations could bring about a change in attitudes. However, simply presenting findings in different formats appears unlikely to change behaviour. Systematic reviews from healthcare give robust evidence that the provision alone of consensus recommendations, educational materials and guidelines is usually insufficient to change practice. Guidelines were found to effect practice change only when supported by active implementation strategies, specifically reminders, incentives, peer review, marketing and educational interventions. However, such studies do not distinguish whether effectiveness is related to the form and content of the guidelines or of the implementation strategy. A systematic review by Smith (2000) found that the likelihood of guidelines adoption was influenced by the quality of the guidelines, the characteristics of the practitioners and the local and organisational context. Another found that half the variation in guideline compliance could be explained by the characteristics of the message (Grilli and Lomas, 1994). Evidence about the value of including end users in guideline development was inconclusive.

   The mass media can also be used to disseminate research, through television, newspapers, magazines, radio and video. There is reasonable evidence of the value of this approach from a systematic review which found consistently positive changes in behaviour across different settings, behaviours addressed and types of intervention (Grilli et al., 2002). It remains unclear whether the effects were equivalent for patients

and health professionals. Other less rigorous research suggests the use of media and other public education programmes can generate community and patient pressure to incorporate research findings into healthcare practice (see Granados et al., 1997 and Palmer and Fenner, 1999).

Research findings can be disseminated orally as well as through written materials. Freemantle et al.'s (2002) systematic review found the use of conferences and workshops had a small additive impact on practice. Three single studies from outwith the healthcare field also evaluated the use of presentations and workshops to disseminate research findings (Bogenschneider et al., 2000; Shanley et al., 1996; Wikeley, 1998). The quality of evidence they provide is mixed and based largely on self-report data, but suggests dissemination efforts which enable the active discussion of findings may enhance impact.

Example

Bogenschneider et al. (2000) describe how Family Impact Seminars have successfully disseminated research findings to state level policy makers in Wisconsin. These provide an ongoing series of seminars, briefing reports and follow up activities directly targeted to the unique information needs, work culture and preferences of their audience. Credibility is provided by a high-level advisory board and respected academic speakers. The study measured effectiveness using questionnaires and follow-up telephone interviews. Seminars were rated highly by participants and policy makers reported using the information obtained in diverse ways, for example to develop pilot programmes.

The evidence suggests that provision of targeted materials can raise awareness of research findings and that seminars and workshops can encourage more direct use. Key features of successful dissemination strategies are:

- tailoring approaches to the audience, in terms of the content, message and medium
- paying attention to the source of the message
- enabling active discussion of research findings.

Theoretical frameworks.

Dissemination strategies are underpinned by adult learning theories which argue that personal motivation is important in achieving behaviour change. Practitioners are viewed as active consumers of new information who want to keep up to date with the latest research findings as a means of professional development. The assumption is that with effective dissemination, behaviour change will simply follow. Similar support for dissemination strategies comes from cognitive theories of rational information seeking and decision making. According to the rational-empirical model, information must be presented to practitioners in such a way as to enable them to engage with it intellectually. This engagement in turn provides the motivation for applying knowledge locally and thus instigating change.

Media advocacy, the strategic use of mass media for advancing a social or public policy initiative, is a relatively new concept. While some basic principles have been developed

this is an emergent approach derived from grass roots activity rather than a theoretical framework (Granados et al., 1997).

Diffusion of innovations theory (Rogers, 1995) identifies five key stages in the adoption of an innovation:

1. Knowledge - about the existence and potential of an innovation
2. Persuasion - forming an attitude towards the innovation
3. Decision - adoption or rejection
4. Implementation - the innovation is put to use
5. Confirmation - reinforcement for an adoption decision in sought.

Dissemination strategies are likely to be important only in the earlier stages of this process. This theory also notes the importance of particular attributes of the innovation to adoption: relative advantage, compatibility, complexity, trialability and observability.

Educational interventions.

Educational interventions are those which aim to increase knowledge and understanding about research findings. They require more active participation by professionals than simple dissemination. Approaches may range from traditional lectures to more interactive sessions. The underlying assumption is that learning about relevant research will increase the likelihood of its direct use.

Evidence of effectiveness.

A number of systematic reviews and overviews offer generally rigorous evidence of the effectiveness of different educational approaches to change healthcare practice.

In an overview of 160 diverse educational interventions, Davis (1998) found two-thirds were successful. When three or more interventions were combined, positive results were shown in 80% of cases. Passive and didactic educational interventions were consistently found to have little or no effect in changing practice in line with the evidence. Davis (1998) also found short events of one day or less typically generated no change in outcomes in terms of practice.

Effectiveness of group education in changing practice varied but improved when this included small group discussions or supervised practice sessions with colleagues or experts. Continuing medical education (CME) interventions were more likely to be effective when they included an interactive element, provided supportive materials or gave opportunities to discuss cases. Continuing nursing education (CNE) was found to improve nursing practice for the majority of participants.

Individual instruction, generally in the form of educational outreach, appeared to be more effective. Educational outreach was widely found to be successful as a single intervention and particularly when combined with a social marketing approach. Overall, effects were modest but important. The impact of the number of visits is unclear, and lack of follow up studies means there is little evidence for effects over time.

Example

Thomson O'Brien et al. (2002c) present a systematic review of 18 randomised controlled trials examining the effectiveness within healthcare of educational outreach visits, defined as the use of a trained person who meets with providers in their practice settings to impart information with the intent of changing the provider's performance. The outreach interventions consisted of several components including written materials and meetings. Some used social marketing techniques, and the number of visits also varied. Studies reviewed used objective measures of provider performance in a healthcare setting or of health outcomes, primarily prescribing behaviour. Outreach visits were found to be effective both as a stand-alone intervention and when combined with complementary interventions.

Evidence of the effectiveness of educational interventions was primarily derived from healthcare studies in which outcome measures were usually change in professional practice. No robust evidence was found as to whether educational interventions might be effective in changing awareness, knowledge or attitudes.

Theoretical frameworks.

There is a vast array of theories concerning education and how people learn, developed within a range of disciplines such as psychology, sociology and philosophy. Adult learning theory, already discussed, will play a role in framing educational interventions. Technical rationality models focus on education to support systematic problem-solving and underpin many passive and didactic educational approaches. Here, the learner is a "blank slate" on which information is to be written. More active models of learning identify the "learner as sponge", unevenly soaking up information, and the "brain as computer", systematically processing the form, if not the content, of information (NCDDR, 1996).

Granados et al. (1997) note that successful educational interventions are typically those which address specific educational principles flowing from a range of learning theories. For example, the individualisation principle suggests that individuals learn at different rates and in different ways, and this is reflected in the effectiveness of individual instruction and outreach. Relevance to learners and consonance with intended outcomes are also important, as where CME offers interactive and hands-on elements.

Social marketing has been used effectively to support outreach interventions. It aims to determine and satisfy the needs, perceptions and preferences of a target group through the design and implementation of appropriate programmes. It seeks to increase the acceptability of a social idea or practice in a particular group and involves the application of commercial marketing strategies to promote non-commercial products. Marketing approaches are grounded primarily in theories of consumer behaviour and use concepts such as market segmentation, consumer research, communication, incentives and exchange theory to optimise target group response. Diffusion of innovations theory also pays attention to how the attributes of the innovation, potential adopters and their social network, the environment and the innovation source affect the likelihood of adoption.

Social influence interventions

Interventions based on social influence use the influence of others, such as colleagues and role models, to inform potential users about research and to persuade them of its value. They aim to change norms and values as a route to changing behaviour.

Evidence of effectiveness.

Patient-mediated interventions give research-based information directly to patients, for example through leaflets or counselling. Overall patient-mediated interventions do appear to be effective as a stand-alone strategy (e.g. Davis, 1998).

Opinion leaders have also been used to inform and persuade healthcare professionals about research-based practice. Opinion leaders are those individuals who have a particular influence on the beliefs and actions of their colleagues (Locock et al., 2001). Studies of research use regularly found that practitioners and policy makers relied on colleagues as key sources of information. Evidence from systematic reviews of the effectiveness of using opinion leaders is mixed. However, robust evaluations of the PACE and *facts* initiatives found that the committed support of opinion leaders was vital to the success of individual projects. The definition of opinion leaders is problematic, and they may also differ between or within groups. Such nuances may not be captured in aggregative systematic reviews.

Example

The PACE (Promoting Action on Clinical Effectiveness) initiative comprised 16 local projects to implement evidence in diverse healthcare settings, supported by an overarching PACE network and team. Individual projects used a range of different interventions to try to secure evidence-based practice. The PACE evaluation relied on semi-structured interviews conducted in two phases, whose findings were triangulated using a questionnaire and in-depth case studies. Key measures were the extent to which both clinical change and learning - professional, individual and organisational - had occurred. The evaluation found that expert opinion leaders were important in the early stages to help endorse innovation. Peer opinion leaders who emerged at a later stage were more important to mainstream implementation. Further, hostile or ambivalent opinion leaders could undermine progress (Dopson et al., 2001; Locock et al, 2001).

Theoretical frameworks.

Social influence and social learning theories emphasise the significance of colleagues and role models to behaviour change. Kanouse et al. (1995) differentiates expert influence, the belief or behaviour of an accepted expert, and peer influence, which occurs when a practitioner notices that respected others have changed their behaviour. Opinion leader strategies are underpinned by social influence theories. More generally, such theories propose that where information resonates with existing norms and values, it is more likely to change behaviour. The opportunity to discuss new information with peers provides the chance for social influence to be exerted or for a consensus to develop.

Diffusion of innovations theory views the adoption of an innovation as an essentially social process in which subjective evaluations will be sought from peers, particularly at the "persuasion" stage. Mobilising the support of opinion leaders is thought to significantly improve the chances of successful innovation. It may be particularly important for interpersonal networks whose members differ in many respects (Nutley and Davies, 2000).

Collaborations between researchers and users.

Collaborative interventions aim to enhance research impact by strengthening the links between practitioners and/or policy makers, and researchers. They concentrate on improving the flow of information and ideas between these communities.

Evidence of effectiveness.

A number of individual studies outwith the healthcare field have evaluated whether developing better links between researchers and users can enhance research impact.

One way of developing connections between researchers, policy makers and practitioners is by changing local structural or institutional arrangements to allow for greater integration. Sobell (1996) describes how practice and research staff were brought together as a single unit in an addictions treatment institute in Canada. Anecdotal evidence suggested the success of this initiative which enhanced understanding among both groups. Laycock (2000, 2001) suggests that the co-location of research and policy teams within the Home Office facilitated the impact of repeat victimisation research on policy and practice. Both her papers are descriptive but the fact that repeat victimisation measures were integrated into police performance management suggests that impact was achieved.

Cousins and Simon (1996) and Huberman (1993) provide systematic and robust evidence from multiple case, long-term studies of policy-induced partnerships between academics and practitioners. They found that practitioner involvement in the research and dissemination process enhanced the direct and conceptual use of research. Personal contact between researchers and users and involvement of users in the early stages of the research process increased the chances of successful impact. Carasco et al. (2001), in a rigorous qualitative study, found that partnerships between researchers, policy makers and community members alongside participatory action research enhanced learning in Ugandan primary schools.

Three small-scale, unpublished studies from the education field provide some limited evidence that partnerships which allow teachers to "test out" research findings and encourage collaborative reflection on the research-practice process can be effective. Jaworski (2000), De Corte (2000) and McGuinness (2000) all detail qualitative evidence that this approach can help develop teaching skills and provide positive learning outcomes. These findings are supported by the evaluation of the Teacher Training Agency School-Based Research Consortia Initiative, which drew on systematic, triangulated data to conclude the effectiveness of this approach (Cordingley and Bell, unpublished).

Example

The Teacher Training Agency School-Based Research Consortia Initiative aimed to develop evidence-informed teaching and learning by enabling teachers to conduct their own research and to "test out" research findings within a supportive collaboration of schools, universities and local education authorities. Approaches varied among the four consortia involved but included "linked pairs" of teachers and academics, individual school research co-ordinators, thinking lunches, action and other research, examining the evidence base, testing out ideas from research and developing new teaching practice. Evidence of effectiveness was gathered from diverse sources, including teacher and pupil interviews and questionnaires, classroom observation and videos, pupil learning logs and teacher diaries and existing data on pupil outcomes. These gave consistent evidence of positive pupil outcomes, of improvements to teachers' skills and capacities and of school-wide changes in knowledge and attitudes. Two key features appeared to support success:

- the involvement of enthusiastic individuals who were able to draw in a "critical mass" of support and activity from other teachers
- integrating engagement in and with research within broader organisational activities (Cordingley and Bell, undated).

These studies suggest that the process of undertaking and "testing out" research in partnership with academics can help research flow into practice. A report by Hillage et al. (1998) provides some limited evidence that action research projects in general may have a definite impact on educational practice. The extent to which links with partner researchers are important to this process is unclear. More generally, research use studies found that experience of undertaking research increased the uptake of findings by practitioners.

The major barriers to developing collaborative approaches to enhance research impact appeared to be:

- differences in culture, goals, information needs, timescales, power, reward systems and language between the research community and practitioners/policy makers
- the time and energy required to establish effective partnerships
- problems balancing competing agendas of partnerships and organisations.

However, spin-off benefits for researchers regularly reported were:

- new "partnership" skills in communication and negotiation
- improved conceptual understanding of their fields.

Theoretical frameworks.

Increasing the links between researchers and potential research users reflect "personalisation" approaches to knowledge management. These propose that knowledge is closely tied to the individual who develops it and person-to-person contact will enhance the opportunities for sharing that knowledge.

Collaborative strategies are also grounded in constructivist theories of learning. These assume that new knowledge is filtered and shaped by pre-existing understandings and that individuals constantly construct meaning and explanations based on their experience. Simply providing research information is unlikely to lead to changes in behaviour. Users need to adapt and re-negotiate findings from research to their own practice or policy contexts. Locock et al. (2001) propose a "convergence" model of communicating an innovation, in which mutual understanding is achieved through a repeated process of social negotiations, adaptation and reconstruction. Diffusion of innovations theory suggests that decentralised methods of diffusion support local adaptation of findings.

Theories of reflective practice (e.g. Schon, 1995) are also relevant here. Both "reflection-in-action" and "reflection-on-action" provide opportunities for learning by reviewing, analysing and evaluating practice. Kolb (1984: see Reimers and McGinn, 1997)) has argued that adult learning will cycle between concrete experience, observations and reflection, formation of abstract concepts and generalisations, and testing implications in new situations. Hargreaves (1999) has called the process of testing and adapting research findings in practice "tinkering", melding explicit and tacit knowledge and contributing to knowledge creation.

Huberman's (e.g. 1993) model of "sustained interactivity" emphasises the importance of linkage mechanisms between the research and practice communities. It is grounded in social learning theory which argues that knowledge is socially constructed and that shared meaning will develop through processes of social interaction or social influence. This process can support the growth of organisational learning through the development of shared cognitive representations.

Incentives.

Incentive-based interventions are those which provide some form of reward or encouragement for activities to enhance research impact or for behaviour which is in line with best evidence.

Evidence of effectiveness.

Some limited evidence was found as to the effectiveness of incentives, usually financial, to support the transfer of evidence to practice.

Within the healthcare literature, studies have focused on the use of financial incentives such as bonuses and penalties to ensure research-based practice. Drawing on both observational and experimental studies, Armour et al.'s (1996) Cochrane review found that explicit financial incentives placing individual physicians at financial risk can be effective in influencing physician resource use. A systematic review by Smith (2000) reports mixed results from a limited number of trials. In an overview of the literature, Palmer and Fenner (1999) conclude that some financial incentives appear to influence practice, but not all, and there is some evidence that initial successes may not persist over time. Lack of evidence makes it difficult to draw firm conclusions about the use of these kinds of incentive.

Outside the healthcare field, two studies offer robust case study evidence of the effects of research funding incentives to encourage the dissemination of research findings. Huberman (1993) describes a Swiss National Research Council funding programme which required researchers to submit detailed dissemination plans. 10% of funding was explicitly set aside for dissemination work outside the academic community. Dissemination activities occurred in all projects to a more or less intense degree, while evidence of changes in knowledge, understanding or attitude were reported for the majority of practitioners targeted. Cousins and Simon (1996) found that funding guidelines could encourage the development of partnerships between researchers and potential users and that these partnerships improved research impact.

Example

Cousins and Simon (1996) examined the impact of funding guidelines developed by the Social Sciences and Humanities Research Council of Canada which encouraged the development of partnerships between researchers and practitioners as a means to promote research impact. During the course of the study, funding guidelines were altered from a simple emphasis on the importance of developing such links to a clear statement that adjudication would favour proposals with strong evidence of partnership development and offering partnership development grants and increased funds for dissemination activities. The number of research projects with partnership components was relatively low but increased following the policy change. Overall, projects with partnerships used more and a wider range of dissemination activities and had a greater impact on the practice community as reported by researchers. Both practitioners and researchers reported additional benefits from partnership participation, including the development of new skills and communication networks, but pragmatic and ideological barriers were found to hinder the development of partnerships formed to compete for grants.

Theoretical frameworks.

The use of incentives is based on learning theories which propose that behaviour can be influenced by controlling motivation through internal and external stimuli. The probability of behaving in a particular way tends to increase when it is followed by positive consequences and decrease when followed by negative consequences. Effectiveness depends on how desirable such "reinforcers" are, in turn depending on individual motivation to gain them. Rewards are an important part of reinforcement for learning (Granados et al., 1997). Economic models of rational behaviour which elevate extrinsic reward over intrinsic motivation are also relevant.

Theories of power also underpin incentive strategies. The use of reward is a form of power which can be exercised to influence the research impact process. These more coercive approaches to enhancing research impact depend on gaining the commitment of those who control resource allocation to be effective.

Reinforcement.

There is an extensive literature from the healthcare field on the use of both audit and feedback and of reminders as ways of enhancing research-based practice. Both

approaches rely on the presentation of information about behaviour to individuals or groups, whether before, during or after that behaviour, to encourage appropriate practice.

Evidence of effectiveness.

The evidence for both audit and feedback and reminders is generally robust, largely derived from systematic reviews of rigorous trials of these interventions.

Prompts and reminders have widely been found to be effective as a single strategy and for a range of behaviours. Wensing and Grol (1994) found reminders were successful in changing primary care practice. Significant benefit is obtained when computer reminders are used in addition to manual reminders, but both are individually effective (Balas et al., 1996a).

Findings regarding audit and feedback are more mixed. There is evidence of the effectiveness of audit and feedback for prescribing behaviours, but an overview by Smith (2000) found audit and feedback had minimal effects in changing practice overall. Any positive changes reported tended to be moderate. Thomson O'Brien et al. (2002a) found insufficient evidence to assess whether audit and feedback together with a complementary intervention is any more effective than audit and feedback alone.

One of the difficulties with looking at evidence on the effectiveness of audit and feedback in general terms is that these kinds of interventions may differ substantially in the nature of feedback information provided, the timing of feedback and how the feedback is presented. Mugford et al. (1991) found that the effectiveness of feedback was mixed regardless of whether this involved simply the passive feedback of statistical information, or more active feedback, for example accompanied by a discussion of practice or professional audit activities. Feedback involving peer comparison and feedback of costs does appear to improve practice (Effective Health Care Bulletin, 1999; Balas et al., 1996b). There is some evidence that feedback has a more direct effect if presented close to the time of decision making or if it is specific to individual patients (Palmer and Fenner, 1999).

Example

Thomson O'Brien et al. (2002b) conducted a systematic review of randomised controlled trials (RCTs) which explored the effectiveness of audit and feedback interventions in diverse healthcare settings. Audit and feedback was defined as any summary of clinical performance over time, in written, electronic or verbal format, and which could include recommendations for action. The form of feedback given differed among studies but was most often provided to individuals, rather than groups. The review examined objective measures of provider performance or of healthcare outcomes. Significant positive changes were found in 8 of 13 trials but changes were moderate. Findings were mixed where audit and feedback was combined with educational interventions or used as part of a multifaceted intervention. Mixed results were also reported for studies which compared the short and longer term effects of audit and feedback.

Theoretical frameworks.

The use of both reminders and audit and feedback are grounded in those learning theories of behaviour change discussed above which propose that behaviour can be influenced by reinforcement. Both feedback and reinforcement are key principles in diverse learning theories (Granados et al., 1997). Feedback facilitates learning by providing information on progress. Peer feedback is also supported by social influence theory, which argues that behaviour can be changed through the perception of what significant others believe and do (see above). Where cost information is involved, the rational-economic model of human behaviour is relevant.

Codification approaches within knowledge management theory support the use of robust systems for providing information to practitioners, particularly using computers. Feedback loops are also core features of systems theory. Audit and feedback mechanisms underpin the design of self-regulating systems and are incorporated into the ideas of single-loop learning (Argyris and Schon, 1978).

Facilitation.

Facilitative interventions are those which enable the implementation of research through technical, financial, organisational or emotional assistance. This may include training in new skills to support research-based service delivery.

Evidence of effectiveness.

Systematic reviews provide rigorous evidence to suggest the value of computerised support systems in promoting research-based practice in healthcare settings. More mixed findings were reported regarding computer decision support systems (CDSSs). In a selective review, Dickey et al. (1999) found consistent evidence that both office tools and teamwork could improve preventive practice in primary care. Training health professionals to deliver preventive education also appears effective.

The majority of studies and reviews in the healthcare sector focus on influencing individual practitioners. Evidence is more limited and less robust concerning broad-based organisational strategies to facilitate the flow of evidence into healthcare. These are often aligned with quality improvement initiatives. Shortell et al. (1998) reviewed "best evidence" of the effectiveness of Continuous Quality Improvement (CQI) programmes. Most studies reported positive findings. Key correlates of success were the participation of a core of physicians, feedback to individual practitioners and a supportive organisational culture. Heller and Arozullah's (2000) review supports the importance of four key features to successful organisational strategies: strong and committed organisational leadership; appropriately defined goals; a facilitative infrastructure; and the means to integrate changes into everyday practice

Five individual studies, examined below, also evaluated facilitative approaches to developing research-based practice. Interventions varied but all provided an initial core of training plus follow-up support in the form of written or personal guidance. Both the quality of this evidence and its findings are mixed.

The implementation of the Front-Line Evidence-Based Medicine Project, which aimed to explore the feasibility of clinicians using findings from clinical trials in everyday practice, met with varied success (Cumbers and Donald, 1998; Donald, 1998). A range of specific institutional and historical barriers limited implementation. Most progress was made where time and money was spent adapting the environment to the intervention. However, three studies suggest that facilitative approaches can support the implementation of evidence-based programmes. Knott (1995) describes how training, ongoing consultancy and extra staff supported the effective implementation of an evidence-based offender rehabilitation programme in a single UK probation area. In the US, the Title V Community Prevention Grants Program provides training, technical assistance and resources to help communities plan and implement research-based delinquency prevention strategies. The Program has supported local-level implementation across the US but institutionalising change appears harder to achieve (OJJDP, 2000). A Canadian project to encourage addictions service providers to use an evidence-based programme used marketing techniques to tailor a package of training, support materials and follow-up consultation. Self-report data found this approach helped ensure the strategy met the needs of the target group (Sobell, 1996). Mukherjee et al. (1999) and Sloper et al. (1999) studied the implementation of an evidence-based "key worker" service in two social services departments and found that adequate training plus ongoing support were vital to success.

Example

Mukherjee et al. (1999) and Sloper et al. (1999) compared the approaches taken by two social services departments to implement an evidence-based "key worker" service. They provide small-scale but rigorous evidence of what makes a facilitative approach effective. Implementation strategies differed between the sites, as did levels of success. Both involved an initial training or information event, followed up by support given through meetings, supervision and steering group feedback. Robust qualitative data suggested that effective implementation was supported by

- a dedicated project co-ordinator
- adequate initial training
- high level commitment to developing the service
- a small-scale, reflective, learning approach.

These studies suggest that facilitative strategies can often be effective where the overall approach to research implementation is more or less coercive (Wikeley, 1998): there is no room to negotiate the meaning of the research and front-line staff are required to provide evidence-based services or programmes. Barriers specific to this approach were:

- low levels of baseline skills which were not anticipated
- difficulties getting staff involved in training
- institutional, cultural and organisational divisions
- lack of ownership of the initiative.

The following seem to be factors in the success of facilitative approaches:

- ongoing support, supervision and motivation
- leadership support at a sufficiently high level
- a supportive organisational structure

- adequate resources to help maintain change
- tailoring to fit - marketing techniques may be useful here.

Theoretical frameworks.

Facilitative approaches are rooted in change management theories that emphasise the importance of enabling strategies which provide practical assistance for individuals and groups to support change. Learning theories of behaviour also emphasise the importance of facilitation, the degree to which an intervention provides the means to take action and/or removes barriers to that action (Granados et al., 1997).

Attempts to create the structural and organisational conditions to support research-based change are underpinned by change management theories and system theories. There is a wide range and diversity of change management models. Some pay attention to the context of organisational change, its process and its content, emphasising the complexity of organisations and of the environments in which change must occur. Others propose that organisations, like individuals, undergo a series of stages in the process of change which need to be attended to. One such defines the "unfreezing" of old behaviours, "changing" to a new position, and then the "refreezing" of new attitudes, policies and practices (Lewin, 1951). Quality improvement models are based on the key concepts of continuous improvement, a customer focus, structured processes and organisation-wide participation.

Multifaceted interventions.

Multifaceted interventions are those deploying two or more of the practices detailed above to enhance the impact of research. They target multiple mechanisms to try to get research into practice.

Evidence of effectiveness.

Robust systematic reviews and overviews from the healthcare literature overwhelmingly conclude that multifaceted interventions are more likely to be successful than single strategies. There has been some attempt to explicate which combinations of strategies are more effective. Overall, combinations found to be more successful than strategies used alone were:

- educational materials and feedback
- group education and practice support
- group education and feedback
- educational outreach with other interventions.

However, these studies give no indication of whether combining strategies simply provides an additive effect or how elements within these combinations might interact.

Case studies of three large-scale healthcare initiatives provide some insight into these mechanisms. The research reported below provides rigorous evidence for the effectiveness of their different approaches.

The PACE (Promoting Action on Clinical Effectiveness) programme sought to implement clinically effective practice in 16 sites. Local approaches differed but all were multifaceted. Project teams were supported by an overarching PACE team and through a series of project group meetings. Eight projects successfully achieved substantial levels of clinical change and of individual, professional, or organisational learning. Six achieved significant clinical change but had low levels of learning: for one the reverse was true; and one had low levels of both. Key factors for success were strong evidence, supportive opinion leaders, good project management and integration within a committed organisation. However even where evidence was strong there still needed to be some form of local adaptation and ownership for successful impact. Multifaceted educational interventions proved an effective approach for adapting research findings. Prior analysis of context, piloting approaches and developing clear communication strategies were also viewed as important. The PACE experience suggests research implementation should be viewed as a non-linear, complex and messy process requiring time, flexibility and facilitation (Dopson et al., 2001; Dunning et al., 1999).

The *facts* aspirin programme aimed to create a reproducible, cost-effective and quality controlled framework for changing GP behaviour across Sheffield in line with best evidence. Its approach embedded the concept that successful widespread change can only occur through understanding the complexity of its context. Detailed contextual analysis and extensive coalition building among key stakeholders was undertaken before the project was officially launched. An "aspirin pack" was developed using marketing techniques which targeted likely barriers to change and allowed local flexibility in implementation. The project was advertised in key practice forums and a project worker supported the implementation process in individual practices. More than two-thirds of Sheffield practices were recruited and the majority successfully completed the programme. Routine monitoring data revealed significant positive practice changes in prescribing and these persisted for 3-6 months in more than 80% of cases. Interviews, project team diaries and observation provided qualitative evidence which showed that key elements of success were:

- coalition building to create awareness of and support for the programme
- ease of implementation of the aspirin pack
- ongoing project worker support - both practical and psychological
- the institutional independence of the project team

(*facts*, undated; Musson, undated).

Wye and McClenahan (2000) provides rigorous qualitative evidence of the success of 17 small-scale projects making up the North Thames Purchaser-Led Implementation Projects Programme. Each site used diverse multifaceted approaches to support research-based changes in practice. Observation notes, telephone interviews, self-assessment questionnaires and project team reports were used to assess progress. Practice change was demonstrated by only three projects after 18 months. However, most projects reported improvements in skills, knowledge, systems and services, and in the development of new networks and relationships. There was also evidence of sustained change in 5 projects based on whether the local model had been applied elsewhere or in different contexts. Wye and McClenahan (2000) found four features supported effectiveness:

- sufficient resources, in terms of time, money and appropriate skills. Frontline and change management staff need both applied and interpersonal skills;

- the proposed change needs to offer benefits of interest to frontline staff to ensure motivation;
- enough of the right people, and all key stakeholders, need to be involved from the start; and
- the approach needs to be interactive and relate research clearly to current practice.

These findings are less optimistic than systematic reviews about the effectiveness of multifaceted approaches. However, key elements of success resonate with those identified for other types of research impact strategy. These are drawn together in the conclusion.

Theoretical frameworks.

Theories underpinning multifaceted strategies will vary according to the approaches selected. However, overarching, integrated theories, such as the trans-theoretical model, may help support multifaceted interventions (Smith, 2000). Social learning theory also emphasises the multiple variables that influence behaviour change and so are of value in planning multi-component initiatives.

Theories of change propose that individuals and organisations differ in their receptivity to change and perceive different barriers and benefits. These need to be targeted appropriately, such as through a contextual analysis. Social marketing may be a valuable approach here. Models for planning change are also useful. The PRECEDE model is concerned with identifying and tackling predisposing, enabling and reinforcing factors (Green et al., 1991). Predisposing factors provide the motivation for change, such as beliefs, attitudes and perceptions. Dissemination and educational interventions may be useful here. Enabling factors allow change to be realised, and facilitative strategies target these. Reinforcing factors encourage change and that it is sustained. Reminders, incentives and audit and feedback are relevant at this stage. Another model identifies precontemplation, contemplation, preparation, action and maintenance stages to the process of change.

Barriers to effective research impact.

A raft of generic barriers to effective research impact were also identified in systematic reviews, intervention evaluations and studies of research use. Supported by strong evidence, these are detailed below.

Barriers to researchers engaging in research impact activities:
- lack of resources - money and time
- lack of skills
- lack of professional credit for disseminating research.

Barriers to users' engagement with research:
- lack of time - to read journals, attend presentations or conduct their own research
- low priority in relation to internal and external pressures
- poor communication of research within organisations

- perceptions of research - for example, internally conducted or commissioned research is more likely to be seen as relevant and hence considered
- research is not timely or relevant to users' needs
- research is less likely to be used where findings are controversial or upset the status quo
- other sources of information may be valued more highly, particularly by policy makers
- individual resistance to research, especially when viewed as a threat to "craft" skills and experience - which can have a wider effect if it occurs at management levels
- failure to value research at an organisational level, or an actively hostile organisational culture.

4. CONCLUSIONS - WHAT SUPPORTS EFFECTIVE IMPACT ?

Current knowledge on what makes for effective research impact is imperfect in nature and extent. However, this review has identified a number of practices that seem to increase the chances of success:

- active dissemination can help raise awareness of research and may support more direct use where discussion of findings is enabled
- individualised educational strategies and those which allow interaction with colleagues and experts
- supportive opinion leaders, both expert and peer
- developing closer links between researchers and practitioners, for example through partnerships
- support for practitioners to "try out" research findings and to conduct their own research
- reminders, although these have only been examined in healthcare settings
- adequately resourced facilitative strategies
- multifaceted interventions, particularly where attention is paid to the contexts and mechanisms of implementation.

The evidence is less clear concerning incentives, although research impact increases when implementation activities are a criterion for research funding. This review also points to the importance of explicating the processes underpinning research impact practices and how these interact with specific contexts. Theoretical models can be useful both for understanding these linkages and for planning effective interventions.

Some key features of successful practices also emerge from the literature:

- Research must be translated.
  To have an impact, research findings need to be adapted to or reconstructed within practice and policy contexts. This can involve tailoring findings to a target group, enabling debate about their implications or "tinkering" with research in practice. Ownership is important to uptake.

- Enthusiasm.
  Individual enthusiasts can help carry the process of research impact. They are vital to "sell" new ideas and practices. Personal contact is most effective.

- Contextual analysis.
  Successful initiatives are those which analyse the research impact context and target specific barriers to and enablers of change.

- Credibility.
  Impact is enhanced where there is
  - strong evidence
  - endorsement from opinion leaders
  - high level commitment.

- Leadership.
  Strong and visible leadership, particularly at higher levels, helps provide motivation, authority and organisational integration.

- Support.
  Ongoing support for those implementing changes increases the chance of success. Financial, technical and emotional support are all important. Dedicated project co-ordinators have been core to the success of several initiatives.

- Integration.
  To support and maintain research impact, activities need to be integrated within organisational systems and activities. All key stakeholders need to be involved.

Many of these findings come from the healthcare literature where research impact activities have emphasised changes in behaviour rather than more "conceptual" uses of research. There is also less evidence of what works in enhancing research impact in policy rather than practice contexts. However, this review has found that different sectors share common barriers to research impact, and that there may be value in cross-sectoral learning about what works to overcome them.

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APPENDIX I.

Search terms used.

- evidence-based
- evidence-based practice
- evidence-based policy
- research-based policy/practice
- research/evidence-based change
- research/evidence use/utilisation
- evaluation use/utilisation
- research/evidence/evaluation into practice/policy (or application)
- effective policy/practice, OR effectiveness AND policy/practice
- knowledge-based change
- policy making
- what works
    - AND
        - implementation (implement(ing), etc.)
        - intervention
        - dissemination
        - impact
        - change + behaviour/organisation
        - organisational change/behaviour/strategy
        - change + implementation
        - organisational innovation
        - education(al) activities/sessions/outreach/programme/strategies
        - continuing education
        - decision (making)
        - (practice/policy) guidelines
        - information campaign/material
        - information/knowledge management/system
        - quality improvement/management/assurance
        - opinion leader/product champion
        - feedback (e.g. mechanism, loop)
        - social marketing
        - subject areas:
            - social care (e.g. social services, family services, services for the elderly)
            - education (e.g. primary and secondary)
            - criminal justice (e.g. probation, courts, prison, offenders, policing, youth justice)

Refined search terms.

- outcome/s- outcome research/research outcome/s
- impediment* e.g. to research implementation
- relevanc* e.g. of research to policy

- empirical – empirical research/findings…
- translat*- translating research/findings/results
- influence – research influence
- apprais* - appraisal of research findings/research appraisal
- challeng*
- effective practi*e
- initiative*
- accredited (program*)
- adopt*
- framework*
- connect* (connecting research & practi*e)
- network*
- effective adoption
- constraint*
- practice/research delivery
- research accessibility
- practi*e-focused/research focused
- targeted dissemination/diffusion
- meta-analysis (replacement for systematic ?)
- interaction (research-policy interaction)
- research-policy/policy-research
- action research
- research-application
- interchange (research-practice interchange)
- constraint* e.g. instead of barriers
- research-led policy making/research-led practi*e
- research transfer
- communication (research communication/research-practice communication)
- (research) assimilation
- influencing polic* (influencing policy NRBY research)
- implementation strateg*
- policy-relevant & research/findings/studies/guidelines) OR research 7 relevant & policy
- joining e.g. joining research & practice (instead of linking)
- evidence-focused/evidence-led (& e.g. policy)
- contribut* W/2 (of) research W/2 (to) practice
- "user friendly" research/findings/evidence
- assimilation & (W/2) research/findings/evidence (to policy/practice) - in place of use/utilisation etc.
- policy-literate research/research-literate policy/practice
- adoption of innovation* W/2 policy/practice/research
- research-policy exchange/interaction
- research implementation strateg*/dissemination strateg*
- restrict* e.g. W/2 evidence/research, use/implement*/appl*
- strategic utili*/appl*…& research/evidence (W/2)
- permeate (to replace diffusion)
- clinical/other effectiveness
- dissemination/implementation strateg*
- research-based information & util*/implement*/appl*
- dialogue e.g. research-policy dialogue
- knowledge utili*ation (& systems)

- collaboration/partnerships
- school improvement
- empirical practi*e/empirically supported
- research minded/ness

APPENDIX II.

Selection criteria.

Selection of papers for inclusion in the review was be a two-stage process. Initial broad selection criteria were used with the titles and abstracts of papers retrieved from searches. Criteria for including papers at this stage were:

- located within the education, healthcare, criminal justice or social care sectors, or policy making in general
- refers to research utilisation or to implementing evidence-based policy and/or practice.

Where there was any doubt from the abstract as to whether a paper should be included at this stage, the full text was retrieved and these initial criteria applied to the whole paper.

Selection criteria for full text papers.

1. Conceptual papers

Included papers had to contain:

- discussion of the theories, models or conceptual frameworks used to guide the development of a practical strategy to enhance research impact
- explicit consideration of a theory, model or conceptual framework to support research utilisation or implementing evidence-based policy/practice
- construction of a framework or model for developing evidence-based practice across a broad sector, sub-sector or professional area (e.g. social care, nursing)
- a theoretical or conceptual review of ideas about research utilisation or implementing evidence-based policy and practice.

2. Empirical papers

Included papers had to be empirical studies of:

- interventions designed to enhance the impact of research-based evidence on policy/practice
- what inhibits and what enables the use of research-based evidence in policy and practice
- empirical studies of the use of research-based evidence in policy/practice
- reviews of the above

Where a paper simply provided a descriptive account of a research impact intervention, it was coded as a "background paper" to provide information on the nature of interventions which have been developed and for further searching.

3. Methodological papers

Included papers had to be:

- conceptual or empirical papers which consider issues of how to measure and assess the impact of research.

Checklist of selection criteria for empirical papers.

- must be concerned with implementing research-based evidence, not other forms of evidence

- populations studied must be one or more of:
  - practitioners
  - service managers
  - policy-makers (at any level)
  - clients or service users *only* where the intervention aims indirectly to target one of the three groups above
  - researchers

- enhancing the impact of research-based evidence must be a primary objective of any intervention studied.

APPENDIX III.

Data extraction forms.

Data extraction form for mapping exercise.

This was used for all empirical papers identified.

DATA EXTRACTION CATEGORIES: MAPPING EXERCISE.

ID reference number _____ **Date** _____

Bibliographic details

Author (1st only) _____
Year _____
Title of paper _____
_____
Source _____
Sector _____

Type of paper

Paper type _____ **Published Y / N**
Content of paper _____

Conceptual frameworks

Models/theories of research utilisation _____
_____
_____
_____

Models/theories of measuring research use _____
_____
_____
_____

Empirical studies

Topic _____
_____
Study/review type _____
Country _____
Study setting _____
Study design _____

Study population

Name of intervention/project

Type of intervention

Intervention population

Intervention provider

Intervention theories

Outcome measures

Methods for measuring research use (where relevant)

In-depth data extraction form.

This was used for all single studies which evaluated specific interventions, all overviews of systematic reviews of intervention trials from the healthcare field and both the non-health reviews.

EMPIRICAL PAPERS: IN-DEPTH DATA EXTRACTION.

1. Publication details

(Use those from mapping exercise).

Author (1st only)
Year
Title of paper

Reference no.

2. Indexing categories

Content of paper
Sector area
Sub-sector area

Study type

3. Nature of the study

(i) Aims

- **aims of the study**

- **any further research questions**

(ii) Study design

- **study type and design**
  (give main type(s) e.g. outcome evaluation and details of methods used)

- **study date and duration**

- **any research tools used**

- **analysis used**

(iii) Study context

- **country**

- **location**

- **site(s)**
  (describe setting and details of key characteristics e.g. of organisation/institution)

(iv) Study participation

- **target population**

- **sampling/recruitment procedures**

- **numbers of participants**

- **characteristics of participants**
  (e.g. type of policy-makers/practitioners, types of post held, age, sex etc.)

(v) Theoretical framework

- **details of any theory referred to or conceptual models used**.

4. Nature of intervention (where applicable)

- **aim of intervention**

- **country**

- **location/setting**

- **target population/of change**

- **intervention design**
  (give details of content)

- **intervention process - delivery and providers**

- **details of development of intervention**
  (e.g. reasons for development, any "needs assessment" or involvement of target population)

- **any theoretical frameworks drawn on to develop the intervention**

5. Outcomes

- **outcome measures used**

- **details of outcomes/findings**

- **any details of strengths/limitations of the study given**

Limited data extraction form.

This was used with all other empirical papers selected for synthesis.

EMPIRICAL PAPERS: CORE DATA EXTRACTION.

First author and date

Title

Focus
- Country, setting, population studied etc.
- Also include details of the intervention here.

Aims of the study

Methods
- Include any limitations of the study given.

Findings

APPENDIX IV.

Quality assessment criteria.

Different quality assessment criteria were used for different study methods. Where a study was mixed method, separate relevant assessment criteria were used for qualitative and quantitative approaches.

Quality assessment criteria: qualitative studies.

(i) Aims
- **are the aims of the study clearly stated ?**

(ii) Conceptual framework
- **is there an explicit account of the theoretical framework and/or inclusion of a literature review which demonstrates how the study is informed by or linked to an existing body of knowledge ?**

(iii) Study design
- **is the study design appropriate to the stated aims ?**
- **are the study design and data collection processes adequately described ?**
- **is the researcher's perspective clearly stated and taken into account ?**

(iv) Sampling
- **is there a clear description of the context of the study ?**
- **is the sampling strategy clearly described and justified ?**

(v) Analysis
- **is the analysis described ?**
- **if so, to what extent is the analysis systematic and externally replicable ?**
- **are efforts made to establish the validity of the findings ?**

(vi) Conclusions
- **are important influences on the observed outcomes considered ?**
- **is sufficient evidence provided to demonstrate that the results and conclusions are grounded in the data ?**
- **are the findings clearly linked to the original aims of the study ?**

Quality assessment criteria: quantitative studies.

(i) Aims
- **are the aims of the study clearly stated ?**

(ii) Conceptual framework
- **is there an explicit account of the theoretical framework and/or inclusion of a literature review which demonstrates how the study is informed by or linked to an existing body of knowledge ?**

(iii) Study design

- **is the study design appropriate to the stated aims ?**
- **are the study design and data collection processes adequately described ?**

(iv) Sampling

- **is the sampling strategy clearly described and justified ?**

(v) Results

- **what outcomes are measured ?**
- **are the outcome measures likely to be sufficiently a) valid and b) reliable for the purpose ?**
- **are the basic data adequately described ?**
- **are important outcome measures ignored ?**

(vi) Analysis

- **are the statistical methods used adequately described ?**
- **is statistical significance assessed ?**
- **where details are given, do the numbers add up ?**

(vii) Conclusions

- **are important influences on the observed outcomes considered ?**
- **are the findings clearly linked to the original aims of the study ?**

Additional assessment criteria for quantitative studies employing control/comparison groups.

- **were the control/comparison groups equivalent ?**
- **were the groups treated equally aside from any intervention ?**
- **was follow-up of all participants complete ?**
- **are data reported for all groups both pre- and post-intervention ?**
- **are results analysed by original group allocation ?**

Additional assessment criterion for surveys.

- **is the survey response rate adequate ?**

Quality assessment criteria: reviews.

(i) Aims

- **is the review topic clearly defined ?**

(ii) Sampling

- **is it likely that important, relevant studies were missed in the search for papers ?**
- **are the inclusion and exclusion criteria appropriate to the review topic ?**

- **is the quality of included papers adequately assessed ?**

(iii) **Results**
- **are results of all included studies adequately described ?**
- **are the reasons for any heterogeneity in results considered ?**

(iv) **Synthesis**
- **are the methods used for synthesising results adequately described ?**
- **are attempts made to address the effects of any missing information ?**
- **are attempts made to take into account the effects of important biases ?**

(v) **Conclusions**
- **are the overall findings of the review clear ?**
- **are the major relevant outcomes considered ?**
- **are the conclusions drawn by the review justified ?**

APPENDIX V.

Interventions identified.

Interventions studied in the healthcare literature.

- Training, with or without follow-up technical or other
- Audit and feedback
- Reminders
- Computer support systems, including computer decision support systems
- Mass media
- Passive/didactic education
- Continuing medical education and continuing nursing education
- Educational outreach
- Consensus recommendations
- Printed educational materials
- Guidelines
- Organisational interventions
- Quality improvement initiatives
- Office systems
- Financial incentives
- Opinion leaders
- Patient mediated interventions
- Multifaceted interventions
- Use of social marketing techniques to support other interventions

Interventions studied in education, social care and criminal justice.

- Training plus follow-up support - technical, financial, supervisory
- Clinical partnerships
- Collaborations/partnerships of researchers and users
- Institutional co-location of researchers with policy or practice staff
- Multifaceted interventions
- Research presentations - workshops, seminars
- Research funding criteria to encourage research impact activities
- Use of social marketing techniques to support other interventions

Additional interventions described in background papers.

Dissemination

- Provision of translated research to practitioners and policy makers e.g. summaries, policy briefs, syntheses
- Translation of research for practitioners and policymakers by specific individuals within organisations or by agencies (e.g. NICE, SCIE, Cochrane Collaboration)
- Raising awareness of and facilitating discussion about research through journal clubs, brown bag lunches, existing committees and meetings and use of the internet, including e-mail discussion groups

Collaborations between researchers and users

- Individuals with key roles which link user and research communities, such as lecturer-practitioners and policy brokers. Help to maintain and facilitate linkages by building up relationships over time
- Use of internet and e-mail discussion groups as conduits for collaboration and network development
- "Learning collaboratives" within healthcare to develop common approaches to measuring and improving healthcare outcomes
- Collaborations which also involve members of the local community or service users

Facilitative interventions

- Enhancing access to research through
  - circulation of research within organisations, by individuals, libraries, information services
  - provision of electronic access e.g. databases and libraries, sometimes with support for conducting searches
- "Replication kits" which support the implementation of evidence-based programmes, containing e.g. a user's manual, videos, group exercises
- Diverse supportive software systems e.g. for storing, accessing and updating research information, or to underpin the entire process of developing and implementing evidence-based programmes

Multifaceted approaches

- A range of organisations and agencies aiming to develop evidence-based practice are incorporating diverse approaches and practices. Often based on a form of partnership or collaboration among the agencies, practice organisations and academia. Generally use varied forms of dissemination and may also provide training, for example in critical appraisal skills, support practitioners to "test out" research findings in local contexts, carry out action research projects and pilot test research findings themselves. Some examples are Nurse or Practice Development Units; the Centre for Evidence based Social Services; Research in Practice.