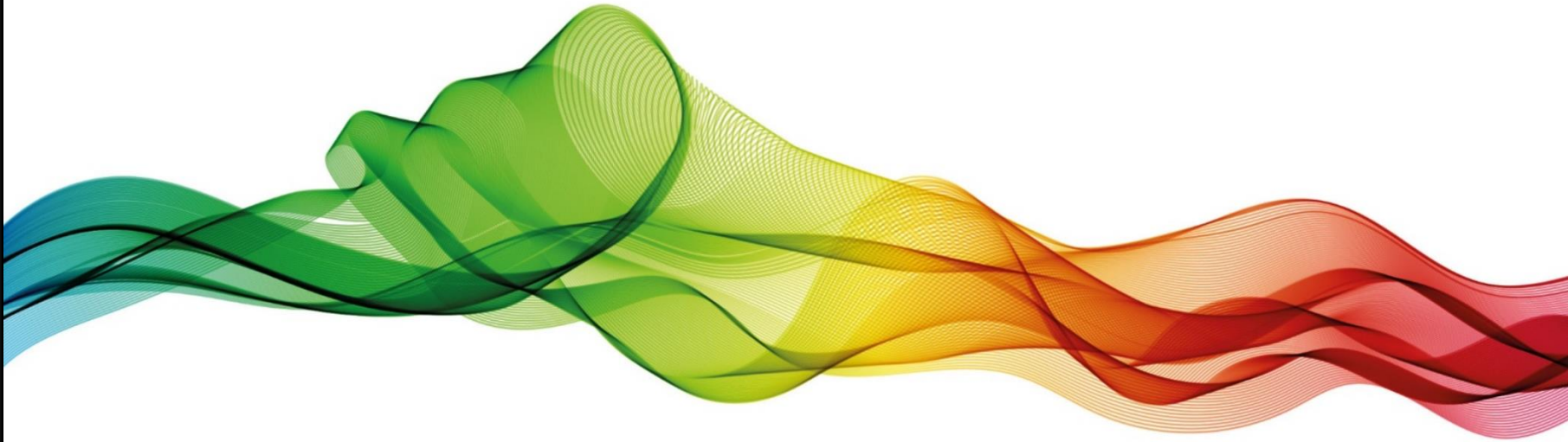


Collecting Research Impact Evidence

Best Practice Guidance for the Research Community



BOKANI TSHIDZU
#IMPACTEVIDENCE
5 JULY 2016

WHY WE'RE HERE

Impact is
important to
funders

Real time
monitoring
essential

Focus on
amplifying
impact

Impact case
study
preparation

Impact
attribution and
evidence

Key actions

BACKGROUND

Worked across sectors

Third sector

Index Top 10
Pharma

Research
organisations

Aligned with international reporting frameworks

OECD

UN Global
Compact

Global Reporting
Initiative

Expertise

VV-Impact
Tracker

Impact Reports
(e.g. SROI)

Co-authored
papers, training

WHAT IS IMPACT

KELLOGG FOUNDATION LOGIC MODEL FOR IMPACT



WHAT IS IMPACT

HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND (HEFCE) DEFINITION OF IMPACT

“For the purposes of the REF, impact is defined as an **effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia.**” (REF, 2012).

RESEARCH COUNCILS UK (RCUK) DEFINITION OF IMPACT

ACADEMIC IMPACT

“The demonstrable contribution that excellent research makes to academic advances, across and within disciplines, including significant advances in understanding, methods, theory and application.

When applying for Research Council funding via Je-S, pathways towards academic impact are expected to be outlined in the Academic Beneficiaries and appropriate Case for Support sections.”

ECONOMIC AND SOCIETAL IMPACTS

“**The demonstrable contribution that excellent research makes to society and the economy.** Economic and societal impacts embrace all the extremely diverse ways in which research-related knowledge and skills benefit individuals, organisations and nations by:

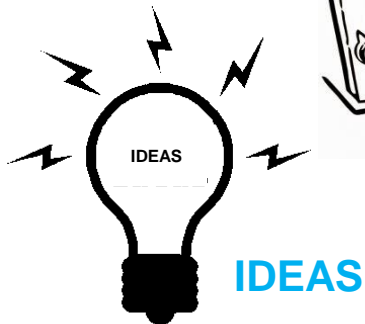
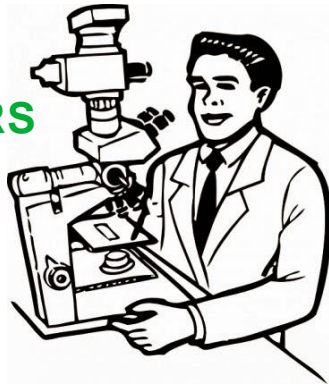
- fostering global economic performance, and specifically the economic competitiveness of the United Kingdom,
- increasing the effectiveness of public services and policy,
- enhancing quality of life, health and creative output.”

WHAT IS IMPACT?



KNOWLEDGE

**SKILLED
RESEARCHERS**



IDEAS

ACADEMIC IMPACT



PLANET

PEOPLE



PROFIT

WIDER IMPACT

RESEARCH EXCELLENCE FRAMEWORK

Impact case study (REF2014)



Institution: University of Sussex

Unit of Assessment: UoA 11 Informatics

Title of case study:

Automatic grammatical analysis enabling advanced text processing in commercial applications

1. Summary of the impact

Research carried out at Sussex into the automatic grammatical analysis of English text has enabled and enhanced a range of commercial text-processing applications and services. These include an automatic Q&A question-answering service and a computer system that grades essays written by learners of English as a second language. Over the REF period there has been substantial economic impact on a spin-out company, whose viability has been established through revenue of around £500k from licensing, development and maintenance contracts for these applications.

2. Underpinning research

The research in automatic grammatical analysis (parsing) of English text underpinning this case study was led at Sussex by John Carroll, in collaboration with a team of academic and industrial researchers at Sussex and elsewhere. At Sussex, Carroll was a Research Fellow, 1995–2001; Reader, 2001–4, and Professor from 2006. The work was partially funded by the following EPSRC grants and EU contracts for which Carroll was the PI:

- Robust Analysis of Unrestricted English Text (EPSC GR/A02751 and GR/L02135, 1996–2001, total £175,102). Building on Carroll's previous work on the Avey Natural Language Tools (ANLT), over the course of this Advanced Fellowship grant he played a key role in creating:
- the first parser based on a manually-developed, linguistically-informed grammar that was able to deal effectively with unrestricted natural language text, and which covers a wide range of both formal and informal constructions of English – in contrast to parsers induced from syntactically annotated text corpora (or 'treebanks'), which are typically restricted to a single language genre;
- an approach to representing and processing language ambiguity efficiently by means of subsumption operations over grammatical categories, allowing the parser to process millions of words of text in little time; and
- the first demonstration of improvements to parsing accuracy through the use of a non-deterministic language-processing pipeline, allowing ambiguity resolution to be postponed to later processing stages without degrading overall system performance (see Section 3, R1, R4).
- Shallow Parsing and Knowledge Extraction for Language Engineering (SPARKLE) (EU FP4 LE12111 subcontract, 1996–7, £44,615). Pioneering contributions included:
- a representation for parser output based on grammatical relations between words, which is suitable for interfacing to natural language application systems; and
- a technique for automatically inferring knowledge about the grammatical behaviour of words from large amounts of unannotated text, allowing a parser to be tuned to a specific domain without the expensive requirement for further syntactically annotated text [C].
- PSET: Practical Simplification of English Text (EPSC GR/L53175, 1998–2001, £167,733).

Page 1

Impact case study (REF2014)



Significant novel research included:

- an efficient, reversible lemmatiser for English based on industry-standard finite-state tools;
- an accurate method for guessing the likely part of speech of a previously unseen word, allowing a parser to process text containing spelling mistakes, abbreviations, acronyms and rare or technical vocabulary; and

Impact case study (REF2014)



conferences.

Outputs [R1], [R3] and [R5] best indicate the quality of the underpinning research at a level that is at least internationally recognised.

Outputs can be supplied by the HEI on request.

4. Details of the impact

In 2003, Carroll (jointly with Ted Briscoe of Cambridge University) founded a spin-out company – iLexIR Ltd – to commercially exploit the research summarised above. Since 2008, the company has developed an extended version of RASP incorporating features that ease the task of integrating it into large-scale application systems. These include:

- adding Unicode compatibility and the ability to process input streams containing XML-encoded text, other types of data, and document metadata;
- embedding the RASP components within UIMA to improve scalability and interoperability (in collaboration with DigitalPebble Ltd) [R6]; and
- integrating the components with a machine learning classifier that is also distributed by iLexIR (<http://iLexIR.co.uk/media/langtech.pdf>). The extended version of RASP is available under a commercial licence (see Section 5, C1).

Below we describe how the research underpins two commercial text-processing applications and services. We indicate the extent of the user population, and the economic benefits in terms of improvements to business processes and revenue from system development and licensing contracts.

• Mobile-phone-based question-answering service

From 2004 to 2009, RESULT Ltd – under the trading names of 82ASK and then later Textperts – provided a UK-wide SMS question-answering service, employing human experts to answer questions submitted by the general public and charging £1 for each answer. In 2007, Textperts contracted iLexIR to develop an automated system to understand directory-enquiry-type questions, so they could be answered with minimal human intervention [C2].

The system produced by iLexIR went live in February 2008. It takes an SMS text message as input and classifies it as being a directory enquiry or not; if it is, the system processes the text using RASP and (to the extent possible) extracts from the set of grammatical-relation analyses the type of enquiry (e.g. address or phone number), the type of entity, its full name, and its broad location. Back-end processing uses this information to query a directory database and generate an answer, which is checked by a human before being returned. The system ran until mid-2009, when Textperts was taken over by the US-based information services company kgb, and its operations subsumed into the parent company's existing infrastructure [C2].

This kind of directory-enquiry automation had not been done previously in a commercial system. Reliably extracting such information from SMS text requires top-down information – embedded in the RASP system – about the grammar structures that the user is most likely intending to use, which are often obscured by misspelled, substituted or omitted words. The application would not have been possible without the underpinning research into the accurate parsing of text containing non-standard language and previously unseen words, and into non-deterministic language-processing strategies and grammatical-relation representations [C3].

The Textperts service received around 100,000 messages a month from across the UK. Of the messages that were directory-enquiry-type questions, the automated system could extract useful information from 60%, and of these, over 90% were correctly interpreted [C3]. The time taken by a human to manually answer such questions was around 30 seconds, whereas the time taken for manual approval of an automatically answered question was only 5 seconds [C2]. Impacts were economic, through system development and licensing contracts to iLexIR worth over £50k [C4], as well as financial savings and service performance improvements for

Page 3

Impact case study (REF2014)



Textperts.

• The automatic grading of English-as-a-foreign-language examinations

Cambridge Assessment (CA) is one of the leading ESOL (English as a Second or Other Language) examining organisations in the world. More than two million people in over 130 countries take Cambridge ESOL exams each year. In April 2008, CA awarded iLexIR a contract to develop a system to automatically grade essay exams, working towards deploying the system as (1) an exam preparation aid that can instantly grade essays submitted online, and (2) an adjunct to human marking of exams, providing additional quality control and speeding up of assessment processes [C5].

The automatic grading system is designed for CA's 'First Certificate in English', an upper-intermediate-level exam, one of whose components, 'Writing', requires candidates to compose a 200–400-word essay, which is graded on a scale of 1–40. The iLexIR grading system uses RASP to parse the essays, and then computes features relating to grammatical sequencing and structure (capturing correctness of grammar) and the complexity of sets of possible analyses (capturing information about grammatical sophistication), as well as features concerning word order. The features are passed to a machine-learning algorithm, which assigns a grade.

Abiation tests demonstrate that the quality of automatic grading is much reduced if grammatical information is not used. Producing this grammatical information relies on several aspects of the underpinning research. In particular, accurate parsing of a wide range of formal and informal language usage, robustness to spelling mistakes, the efficient representation of the full space of possible analyses, and the recovery of fragmentary analyses from ungrammatical and non-standard language. An evaluation has shown that the system's grading is almost indistinguishable from that of experienced human examiners [C6].

System development is leading up to imminent deployment as an exam preparation aid. The impact is economic, through system development, maintenance and licensing contracts to iLexIR worth a total of £450k over the REF impact period [C4].

As a further contribution to the economic impact benefiting iLexIR and establishing its viability, iLexIR has licensed the RASP system (or individual components of it) to three other technology-oriented companies and non-profit organisations during the REF impact period. These licenses were paid for in a combination of cash and equity with a notional total value of £90k, but with a current valuation much in excess of this [C4].

5. Sources to corroborate the impact

- C1 <http://iLexIR.co.uk/licences-and-services/>
- C2 Communication from the former CTO, Textperts and VP Software Engineering, kgb.
- C3 Confidential iLexIR report 82ask: DQ Performance and Error Analysis; can be made available for audit purposes.
- C4 Communications from the Company Secretary, iLexIR Ltd.
- C5 Chief Executive, Cambridge English Language Assessment.
- C6 Yannakoudakis, H., Briscoe, E. and Medlock, B. (2011) 'A new dataset and method for automatically grading ESOL texts', in *Proceedings of the 40th Annual Meeting of the Association for Computational Linguistics*, 180–189, <http://aclweb.org/anthology/P11-1019>.

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IMPACT ASSESSOR PERSPECTIVES

Attribute the impact to the research

- Impact evidence helped research assessors to understand how the research led to impact

Distinguish activities, such as public engagement, from impact

- Evidence that enables assessors to distinguish activities from actual impact
- E.g. Spin out companies and the sales or jobs they create

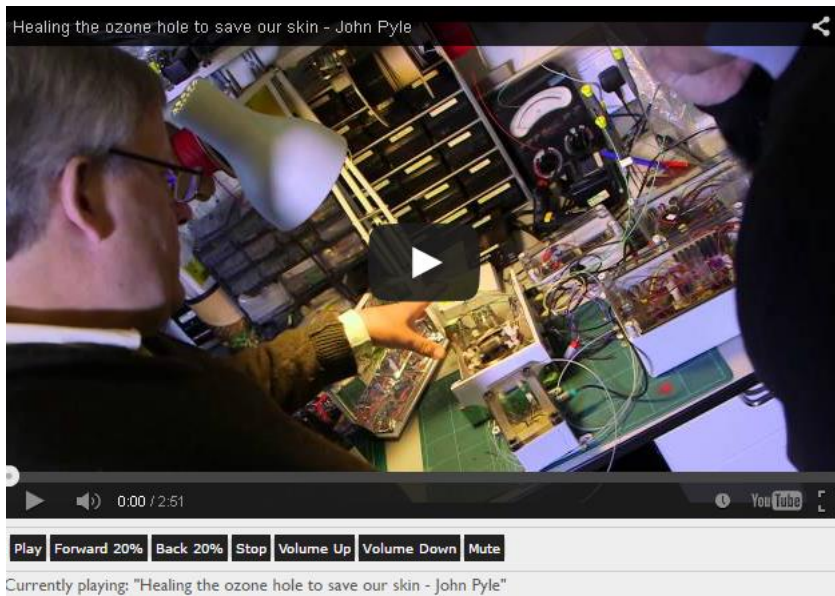
Include simple narratives and empirical data where possible

- Clear and specific narratives
- Where possible empirical indicators demonstrating the impacts that can be aggregated

Allow easy access to the impact evidence

- Ensure the impact data can easily be interrogated, accessed and re-purposed

USES OF IMPACT EVIDENCE



WHAT IS IN IT FOR ACADEMICS?

- Project funding
- Researcher profile
 - What do you want to be known for?
- Career progression

Middlesex University London

Courses Our Research Life at Middlesex **Global Impact** Bus Part

Search mdx.ac.uk Subject, Course, Research, Staff...

Prof Waqar Ahmad

ROLE: Deputy Vice-Chancellor Academic

CONTACT: +44 (0)20 84116554

EMAIL: w.ahmad@mdx.ac.uk

SAVE THIS PAGE

Biography & Qualifications Learning & Teaching Interests Research Outputs & Interests Funded Research & Knowledge Exchange Projects **Engagement & Impact**

- Academician, Academy of Social Sciences
- Member, Hefce Research and Knowledge Exchange Strategic Advisory Committee (current)
- Member, ESRC *Understanding Society* Strategic Advisory Committee; Chair of its Ethnicity Strand Committee (one of three sub-committees)
- Trustee, Woolf Institute Cambridge (with Lord Harries, Lord Hameed, Lady Woolf, Professor Lipner FBA, Lord

IMPACT TYPE



Economic
prosperity, business
and industry



Environment
(planet, air, plant
life, wildlife)



Health, welfare and
quality of life



International
development



Process change



Public policy, public
services and law



Society, culture and
creativity



Academic
advancement,
increasing skills
teaching and learning

IMPACT TYPES

WHAT TYPES OF EVIDENCE ARE YOU COLLECTING TO SHOW THESE IMPACT TYPES?

Economic prosperity, business and industry

Environment (planet, air, plant life, wildlife)

Health, welfare and quality of life

International development

Process change

Public policy, public services and law

Society, culture and creativity

Academic advancement, increasing skills teaching and learning

RESEARCH IMPACT NETWORK ANSWERS

- Quality-adjusted life year
- Office of National Statistics
- Book sales/downloads/lending figures
- Critic reviews –published and online
- Sales figures
- Jobs created (FTE) / saved
- Performance charge
- Implementation of training
- Offers of platforms e.g. columnist for local, national, international paper
- Offers of residency or secondments
- Online commentary and social media volumes
- Citation by international charities and governments
- New strategy document
- New guidance issued by authority
- Patents
- Change in the amount of resources allocated to specific areas
- New businesses created in an area
- News reports of commercial exits
- Sales figures of launch of new product
- Third party formal evaluation results
- Number of spinouts
- Pollution reports
- Bio-diversity counts

STAKEHOLDER

Q: WHAT CHANNELS WILL YOU USE TO COLLECT EVIDENCE FROM THESE GROUPS?

The 'General Public'

- Special Interest groups
- Members of the public

Business

- Small to medium businesses
- Large businesses and multinational companies
- Social Enterprises

Civil Society

- Community organisations
- Societies
- NGOs
- Voluntary organisations

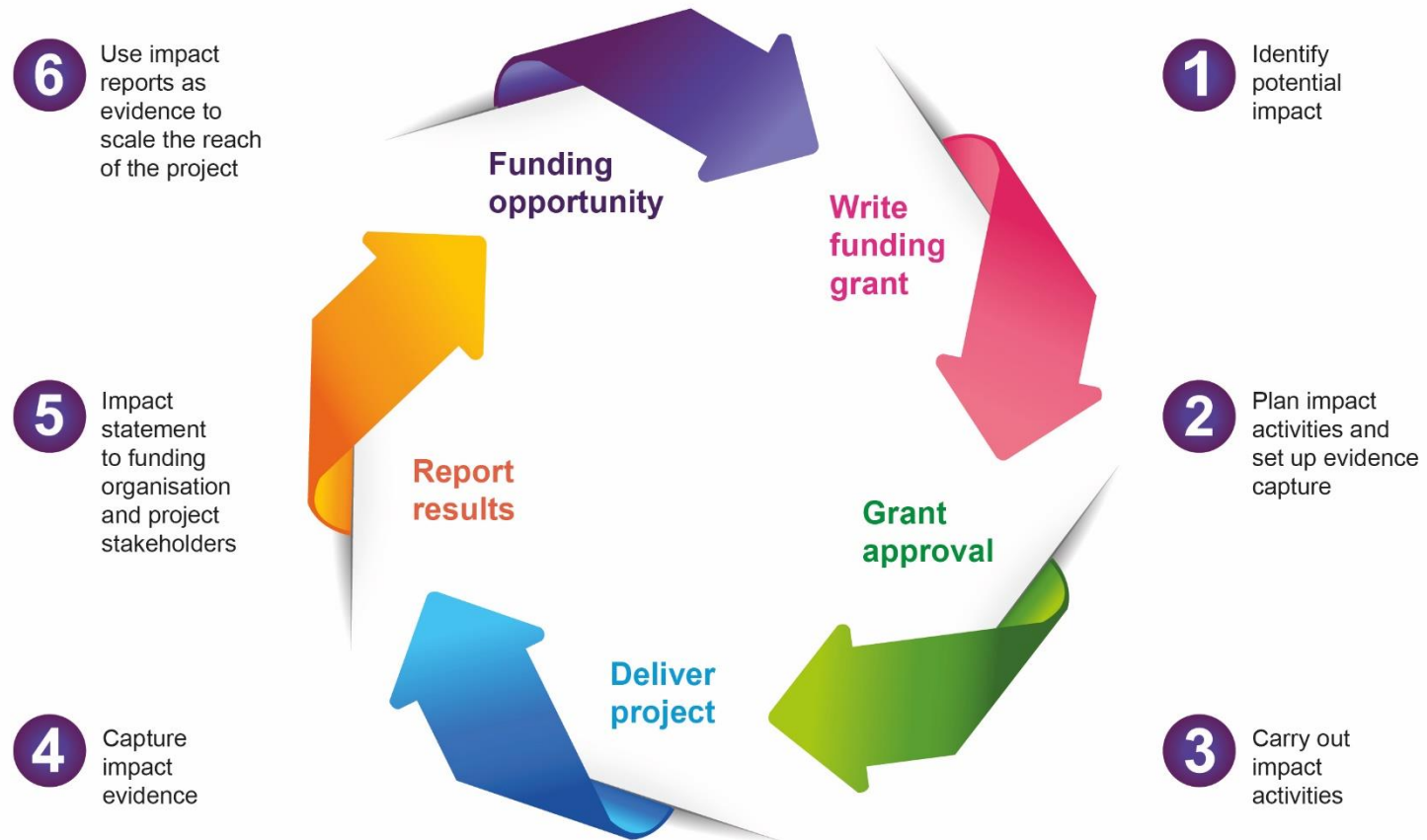
Public Sector

- Schools, colleges of life-long learning
- Culture and leisure Services
- Health and wellbeing agencies
- Regional, national government
- Local authorities, strategic bodies

RESEARCH IMPACT NETWORK ANSWERS

- Annual reports from institutes, companies, governments and NGOs
- Letters of support
- Steering group positions
- Work cited in further funding applications by community/voluntary groups
- Press coverage
- HANSARD
- Surveys- paper and online
- Dialogue through public facing (recorded) events
- One-to-one testimonials
- Focus groups
- Newsletter open-rates
- Comments on TV programmes/news articles and websites
- Event feedback
- Social Media website hits, tweeds
- Personal letter from individual at third party organisations
- Company websites and press releases
- Secondments- Offer letters
- Community meetings and minutes
- On-going testimonials from community party

IMPACT IN THE RESEARCH PROJECT LIFECYCLE



HOW WILL YOU COLLECT EVIDENCE OF IMPACT FROM EACH OF THE FOLLOWING ACTIVITIES?

Events, conferences,
seminars and
workshops

Press activity

Government activity:
steering committees,
white papers

Business/industry
collaborations or
consultancy

Creation of a
digital/web presence

Collaboration, people
exchange

Education, training
and skills

Spin Out Company,
patent and license
Agreements

IMPACT EVIDENCE TO CAPTURE

Stakeholder Information

- Annual reports from institutes, companies, governments and NGOs
- Community meetings and minutes
- Company websites and press releases
- Work cited in further funding applications by community/voluntary groups
- Press coverage

Testimonials

- Letters of support
- One-to-one testimonials
- Focus groups
- Personal letter from individual at third party organisations
- Surveys- paper and online
- Event feedback
- On-going testimonials from community party

Online traffic

- Newsletter open-rates
- Social Media website hits, tweets
- Comments on TV programmes/news articles and websites

Positions of responsibility

- Steering group positions
- Dialogue through public facing (recorded) events
 - Secondments- Offer letters
 - HANSARD

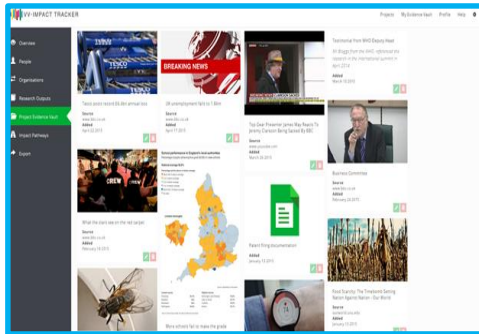
WHAT IS IMPACT

HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND (HEFCE) DEFINITION OF IMPACT

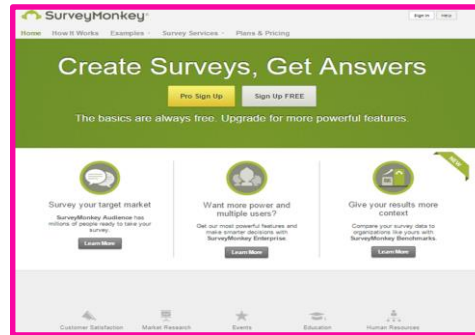
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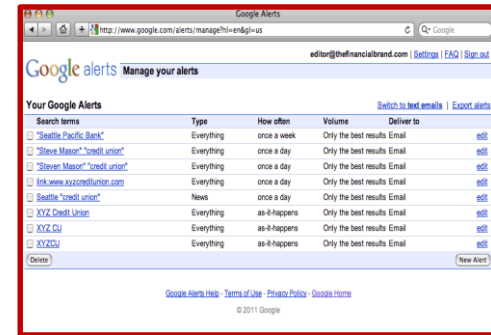
EVIDENCE CAPTURE TOOLS



VV-Impact
Tracker Evidence
Vault



Survey Monkey /
Smart survey



Google Alert -
Trends



Focus groups /
Interviews



HANSARD

WHAT YOU CAN DO NEXT?

Plan for impact at the beginning of projects

Review current projects for where impact may occur

Identify your stakeholders

Identify what you want collect

Identify how you can collect this data

Identify funding and resources for impact activities

Identify where to capture impact data

Re-purpose the information

THANK YOU

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