Benefit measurement in the context of location information

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Business Cases and CBA

- **Business Case**: A *structured* proposal for *business improvement* that provides a package of *economic* and related information sufficient for *decision making*

- **Cost Benefit Analysis (CBA)**: *all benefits and all costs, expressed in money terms, adjusted for the time value of money used to support the economic business case*

Building the Business Case

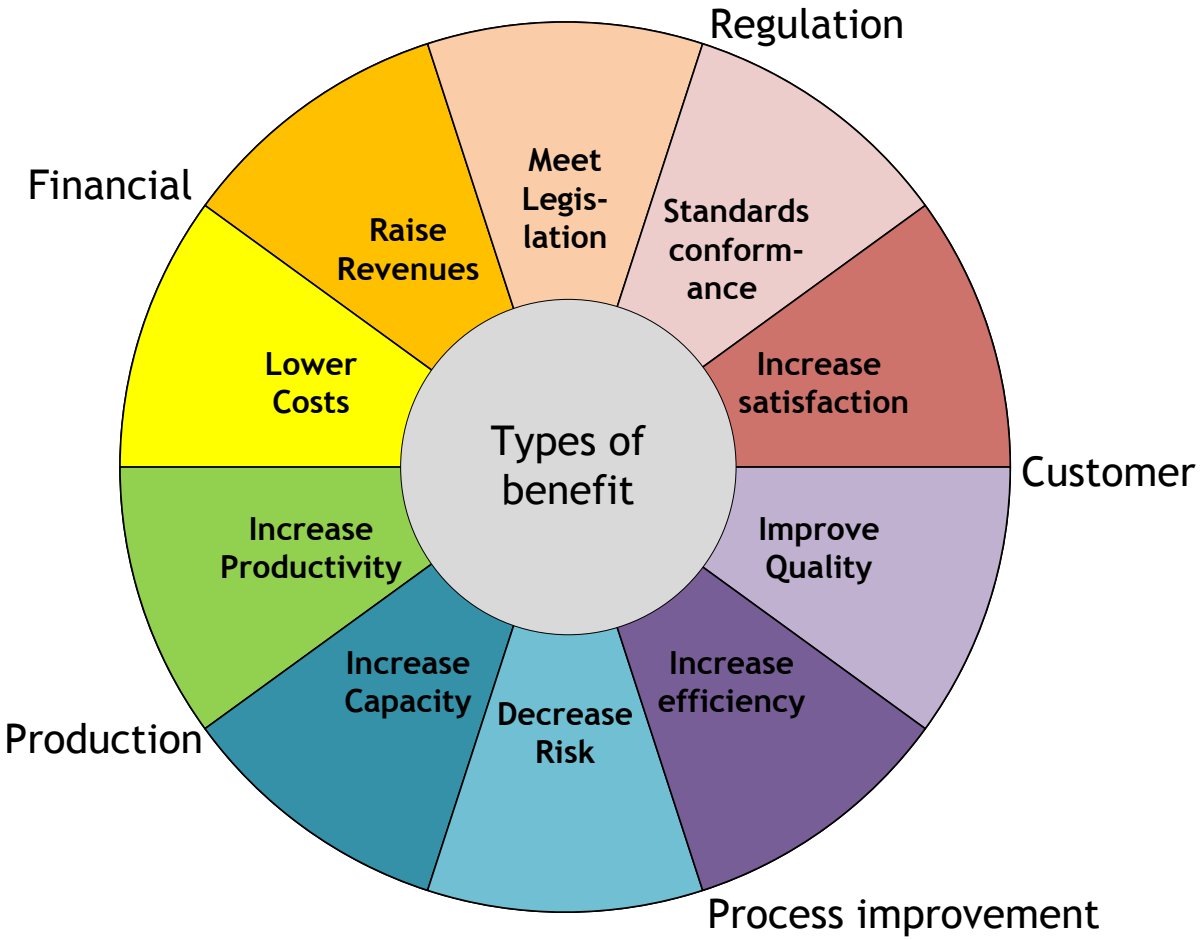
- Definition of the study
  - What problem will it solve?
  - Who are the stakeholders?
  - Is it aligned to the political or corporate agenda?
- Development of the analysis framework
- Measurement
  - Quantification of costs and benefits
- Presentation of the results
  - Discounted Cash Flow
  - Qualitative enhancement
- Communication with decision makers

EULF Cost Benefit Focus

***Table 2** What transitions are we aiming to achieve with the EULF?*

FOCUS AREA	FROM STATE	TO STATE
 Cost Benefit Focus	Variable understanding of the value of location information with little evidence of quantified benefits. Numerous inefficiencies in the collection, publication and use of location information, make it possible to justify change and investment in integration. Opportunities with increased availability of re-usable data to deliver new applications both within government and business and support economic growth.	Investment in location information and INSPIRE is applied cost effectively, with attention given to minimising cost and maximising benefits for government, business and citizens. There are compelling impact assessments and business cases, a rigorous approach to targeting and tracking benefits, and good evidence that benefits are being achieved.

Quantifiable Benefits



Benefits Analysis Framework

- Stage 1 – Preparation
  - Definition - scope, terminology, components
  - Compiling existing quantifiable Information
  - Identify estimators
- Stage 2 – Develop Decision Model
  - Process modelling: breaking down the problem
  - Initial impact estimates
  - Assess the value of information: what are the highest value factors
- Stage 3 – Measurement
  - Design measurement methods for highest value factors
  - Iterate (if necessary) to reduce the level of uncertainty to an acceptable level

Typical Measurement Techniques

1. Census
2. Random sampling
3. Controlled experiments
4. Correlation
5. Willingness to pay

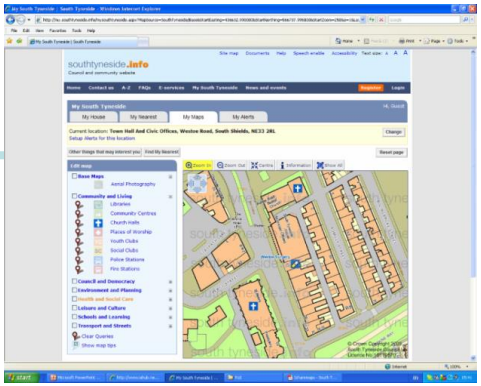
1. Census

- Measure every item or transaction in a set period
  - Example: Population censuses attempt to count all the people living in a country on census day
- Most accurate technique
- Often very costly to do for the purpose of the business case but may already exist in the organisation
- Likely to be available in some "production" environments:
  - Call centre systems (CRM) usually record duration and outcome of all enquiries
  - Land Registry records all property transactions

Census example

- Self-Service Case Study
- Measuring the effect of web mapping information
- CRM system records all phone transactions
- Record number of calls related to the information now available on the web
- Multiply number of calls by channel metrics

South Tyneside UK - example

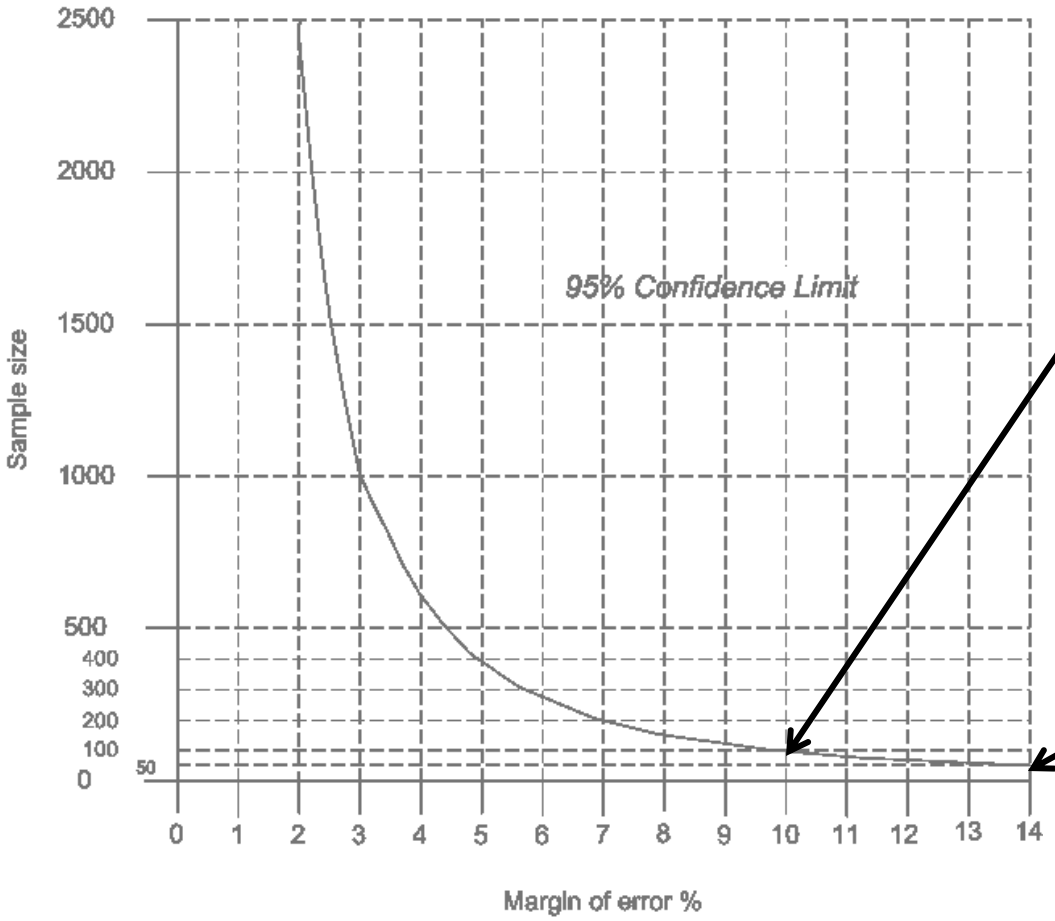


- Web mapping application and service improvements achieved within existing departmental budgets
- Many service objectives met with no additional spend
- Email alerts service > 2000 subscribers
- 38,300 unique visits to online mapping in 2009
- Estimated saving £146k (€ 183k) in 2009 based on estimated costs for web v phone transactions
- Savings in areas such as planning where customers able to self-serve rather than use planning officer time
- Data sharing on website with information from all the council's major systems linked by the UPRN

2. Random sampling

- Most commonly used measurement technique
- Familiar and used often in everyday life
- Key factors in getting a sampling exercise right are:
  - phrasing the question to give a precise answer
  - making sure samples are truly representative of the total population
  - understanding how many samples we need to take for the result to be “statistically significant”
- Depends on the degree of certainty required:
  - is +/- 5% good enough or does it need to be +/- 0.2%?
  - governed by the impact on the business case

How big a sample?



Example 1:
With a sample size of 100 there is a 95% probability that the true mean value will be within +/-10% of the sample mean

Example 2:
With a sample size of 50 there is a 95% probability that the true mean value will be within +/-14% of the sample mean

Sampling - better data sharing example

Newport City Council (population: 145,700)

1. 17 systems currently hold address records, to be replaced with one single master database
2. Average 2300 updates per annum (pa)
3. Sample of 100 observed:
   - 2 mins per change (mean, +/- 10%)
   - Total Savings 16∗2300∗2 = 73,600 mins = 1227 hours pa
4. Average cost of operator: £28k (€35k) pa

   Average productive hours:1650 hours pa
5. Gross benefits:1227/1650∗£28k= £20.8k (€ 25.9k) pa
   - Lower bound (-10%): £18,740 (€ 23.3k) pa
   - Upper bound (+10%): £22,904 (€ 28.5k) pa

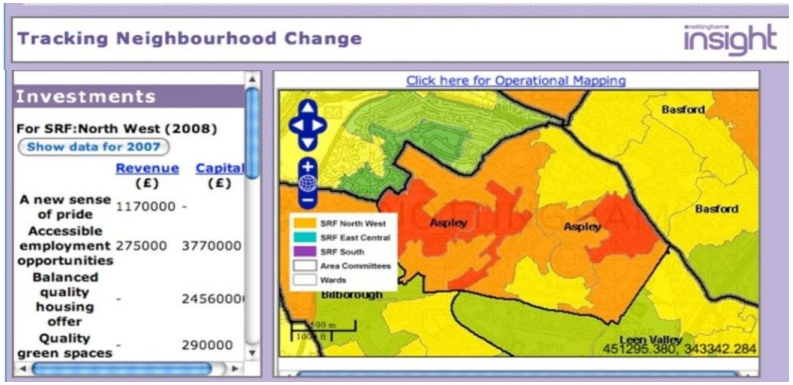
3. Controlled experiments

- Establish test environment where the new process or product is used
- Train staff to use the test environment
- Remainder of staff continue to use the existing approach as the “control”
- Measure and compare productivity of both groups
- Adjust for bias – just observing someone produces a positive effect

Evidence-based decision making: Nottingham City example

Nottingham City Council[1], working with the local National Health Service, police, districts and the county council, wanted to create an online Local Information System:

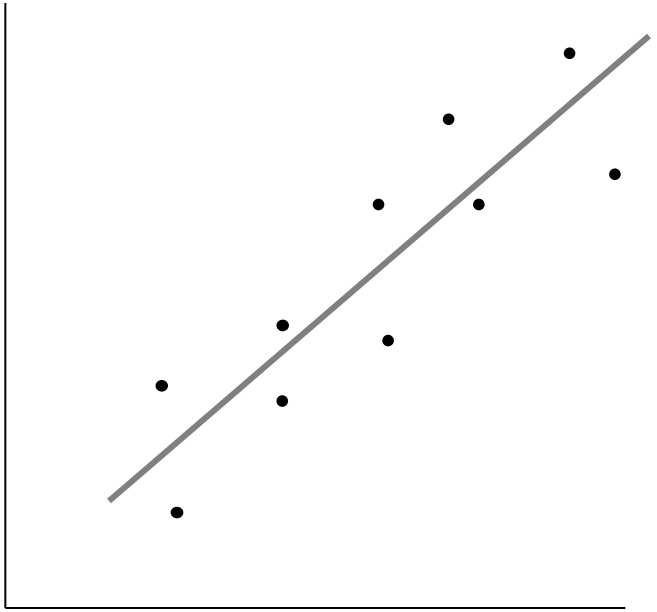
- Providing access to comprehensive, up-to-date information to neighbourhood level for participating organisations and community groups.
- Tools to "mash up" different spatial datasets and pose *ad hoc* queries available from GIS suppliers;
- Savings: £320k (€398k) - £460k (€572k) per annum.



[1]Nottingham Population: 306,700

4. Correlation

- Used where we cannot measure something directly but know that it is related (correlated) to something we can measure



Highly correlated variables

Correlation - insurance example

- Address validation and geocoding
  - Faster insurance quotes using better address gazetteer leading to more business
- Strong correlation known to exist (from CRM statistics) between time taken to provide quote and acceptance rate
- Not possible to directly measure the conversion rate but know its is related to quote time - a large component of which was the gazetteer search performance.
- Customer tied performance to payment to contractor – risk reward approach.

5. Willingness to pay

- A tool of “last resort”
- Often used for estimating value of rare events
- An example might be the willingness to pay for a system that reduces the incidence of flood damage
- Requires precise questions
- Results are subject to a bias towards higher value since usually there is no penalty for a lack of objectivity
- Can be made objective where real costs are tied to real benefits e.g. Cockermouth floods


Willingness to Pay :
Cockermouth example
Maryport
(A594)
Carlisle
Egton
(B5292
Buttermere
(B5289)
COCKERMOUTH MOUNTAIN RESCUE TEAM

Cockermouth flood defences

- Funding for flood protection works was limited:
  - Environment Agency required a local contribution of $556k towards the £5.2m ($10m) scheme
- Council could raise £180k (€224k) from existing funds but would need an additional levy of £120k (€149k) from householders
- Householders asked if willing to pay between £8.97 - £26.90 (€11 - €33) a year for three years on their council tax.
- A survey of 4,153 homes saw householders vote overwhelmingly in favour of paying an extra levy
  - 44.76 per cent return rate
    - Households voting “Yes” - 1,394
    - Households voting “No” – 448 (17 papers were spoiled)

Benefits Realisation

- The business case has a life after the project is approved.
- How are the benefits identified going to be proven to have been made?
- The case needs to state for each benefit how it will be measured and contingency plans to deal with variations
- Finance Ministries are placing increased emphasis on benefits realisation
- National Audit Office in UK has recently delivered a very critical report on environment agency for not managing benefits realisation on its GIS investments[1]
- Consequence is that next project they propose in this area is far less likely to be approved.

Macroeconomic Models

England and Wales Local Government

Assessment of the Value of geospatial to local government:

- Annualised cost to benefit cost ratio of using geospatial information in local government is around 1:2.5 (i.e. £1 spent results in £2.50 savings).
- Leading to a 0.20 per cent increase in productivity for local government and potential for an increase of 0.10 per cent for Primary Care Trusts over the 5 year period
- Real output of local government has increased by £222m (€266m) principally as a result of the productivity benefits associated with the accumulated impact of geospatial applications
- Gross Domestic Products (GDP) for England and Wales was £323 m (€387m) higher in 2009 than it would otherwise have been without the adoption of geospatial information

Communicating Cost-benefit to Decision Makers

Elevator Pitch

Two key elements:

1. Pain statement – what problem are you trying to solve
2. Value proposition – how will your venture solve the problem

Four tests:

1. Succinct
2. Easy to understand
3. Quantifiable
4. Irrefutable

Summary: Cost Benefit Analysis

- Benefits measurement principles
  - Measurement process - Preparation, Decision Model, Calculation
  - Sample measurement methods – Census, sampling, controlled experiments, correlation, willingness to pay
  - Use comparable case studies – many diverse examples now available
- Developing a Discounted Cash Flow (DCF) model
  - To enable objective comparison of different projects
- Plan to prove realisation of benefits when building the business case
- Communications Strategy essential

Thank you

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