# Understanding Quality in Science: A proposal and exploration

Alastair Gill, Maria Xenitidou,
Nigel Gilbert

This work was partly supported by the Future and Emerging Technologies Programme (FP7-COSI-ICT) of the European Commission through the project QLectives (grant no.:231200).

# Overview

- Introduction
  - The problem of ‘capturing’ quality
  - Our approach
  - Research design
- Results
  - Survey
  - Journals
  - Blog
- Further Research

# ‘Capturing’ quality

- Martens and Martens (2001):
  - “...the artist *feels* quality. Everybody *talks* about quality! But to what extent do all our measurements, judgements, evaluations, feelings and talking reflect a common understanding? Quality concerns information that other people consider valuable, and therefore the definition and quantification of quality must create controversy.”

Martens, H. and Martens, M. (2001). *Multivariate analysis of quality: an introduction.* Chichester: Wiley.

# ‘Capturing’ quality

- Many difficulties:
- It cannot be directly measured
- definition varies e.g. according to:
  - topic
  - people involved
  - items being compared
  - time of evaluation
- Ill defined to aid ulterior motives (e.g. funding, RAE/REF)
- judges of quality may not accurately report the features they use when evaluating quality
- lack of external validity (Bartneck and Hu, 2009)

# Our Approach

- Constructionist point of departure: how quality is collectively constructed taking into account different contexts & language as constitutive (of quality)
- Intertextuality: understandings of quality distributed and negotiated across texts
- Processual: observe talk about quality in different settings
- STS & Connectionism: distributed yet interconnected (trace patterns, themes, functions)

# Research Design

- Translating the processual element into a research design of interconnected stages and data:
  - Survey
  - Journals
  - Online Discussions: Blogs
  - Interviews

# Survey

- Online survey hosted at the University of Surrey
- Hard scientists and general population recruited
- Word and phrase descriptions of “quality” collected for prototype analysis at perceptual level (Kearns, and Fincham, 2004; adapted from study of forgiveness)
- Also:
- Names of high/low quality journals to validate scorings for ‘journal analysis’ (see later slide)
- Names of blogs collected for later analysis

# Survey: First Results

- As of 27 September 2010:
  - Responses = 350
  - Full responses = 95 (data from 200 likely to be usable)
- Positive, good, accurate, appropriate, convenient, ‘How good something is’, Value, ‘Worth what you pay for it’, Well-made, Positive, presentable, ‘value for money’, acceptable, satisfactory
- ‘An appropriate range of data with which to draw conclusions’, ‘peer reviewed’, tested, authenticated, authorised, reputation, experience, ‘level of relation’, usefulness, Reliable, Valid, Visibility, Planning, precise, accurate

# Survey: First Results (2)

- What do people say about journals:
  - Undergraduates able to name exceptional journals (e.g. Science, Nature, Cell)
  - Appear less able to distinguish lower ranked publications; comes with more training?
  - Some due to disciplinary/factional prejudice (e.g. Journal of personality and social psychology rated both “good” and “bad”)
  - Also compare “scientist” vs. “non-scientist” responses

# Survey: First Results (3)

Good Journals:

- ones that are approved to appear in both an article and college databases
- Comprehensive and in-depth coverage of latest technology. impact factor, perceived prestige
- Publish most up-to-date papers, highly regulated, well know to all academics in the field.
- other researcher's opinion.  quality of work they publish.  impact of what they print.  reputation.  Most commonly referenced.

# Survey: First Results (3)

Bad Journals:

- low impact factor, relative ease to publish
- Unknown/low reputation, less regulated, lower 'scoring' on research grants. reputation.  lesser known.  less influential.  less impactual research.
- I'm not really very aware of which journals are considered good and bad, other than a few big names which everyone always says they dream of getting a paper in.  I suppose less well respected journals sometimes deserve that reputation because they are less selective in what they publish, but I think the divide is often artificial and unfair, as some journals never get high impact because they're for very selective subject areas and have limited choice of what to publish.  Sometimes even if work is not done to the very highest standards it can still be useful, within reason.

# Journal Analysis

- List of scientific journals from the Australian Research Council (ERA): physics, chemistry, biological sciences, medical science, environmental science, computer science & engineering.
- Stratified random sampling: 2 journal titles of each quality level (A*, A, B, C, Not ranked) for each discipline (=70)

# Journal Analysis: First Results Case Study I

- Corpus Comparison of high (A*) and low (C) ranked (using Wmatrix):
  - 2 titles each ->14 high + 14 low ranked
  - Variety of Hard Sciences
  - Pages: ‘About’ & ‘Aims and Scope’

| A*s | Cs |
|---|---|
| Biological substances & materials | Location & affiliation (status) |
| Issues (content & coverage) | Governance (‘official’) |
| Impact Factor | Education (‘universities’) |

# Journal Analysis: First Results Case Study II

## Physics and Medicine

- Sections:
  - Home Page (Author or Reader-Oriented), ‘About’, Aims & Scope, Submissions
  - Visual: Journal Cover on front/home page
  - Indexing: listing consecutively or in bullet points
  - Impact factor: discursively or bulleted item on front/home page
- Publisher/Society:
  - Society (6): ‘devoted’ (2+1), ‘official’ journal (3-2)
  - Publisher (7): ‘provide’, ‘forum’
  - Institute/University Press (2)

# Journal Analysis: First Results Case Study II

- Patterns:
  - Content
    - ‘High quality’/ ‘Highest quality’ (usually in extreme case formulations, especially in Cs and not ranked), ‘highest’ scientific level, standard
    - ‘research’ papers, articles
    - world’s leading
    - most-heavily cited
    - leading experts
    - ‘original’
    - ‘elsewhere’
    - rigorously refereed
    - ‘important’ (3)
  - Strategies
    - Passive voice and impersonal structures in journal description
      - Journal is the subject (3rd person – agency free, no stake in claims functions factualise claims)
    - Imperative and modality in submission guidelines
      - instruction giving in this way normalises ways to write academically

# Online Discussions

- Online discussions: communities, forums or blogs
  - frequently-reported blogs in the responses collected in the survey
  - Extract science blogs from generic lists

    (e.g. http://blogs.nature.com, http://scienceblogs.com)
- Analysis:
  - building a corpus and apply corpus linguistic techniques (level of word, syntax, and meaning)
  - discourse analysis (discursive psychology)

# Blogs: First Results

Econophysics Forum

- 17 blog posts plus comments
- Stored in Atlas.ti and DA
- Results:
  - Normative style of interaction:
    - agreement/disagreement
  - Expertise:
    - Longevity
    - Publications

# Blogs: First Results (cont.)

- Quality:
  - clarity, specificity, coherence and originality
- Scientific value:
  - grounded on references, citations and peer support
- Orienting to objective measures of quality:
  - appealing to ‘common knowledge’, using numbers and empiricist discourse

# Further Research I

- Scale up the quantitative research
  - So far automated analysis techniques used, but data sourcing/sampling done manually
  - Currently looking in to using Python to scrape journal description webpages
- This could also be applied to other data:
  - Blog data and other sources of discussion (e.g. Twitter) and specific quality cases (e.g. Marc Hauser)
  - Start using machine learning tools to classify journals and compare with ERA ratings
  - Also try this using article abstract?

# Further Research II

- Interviews: Advance Technology Institute (ATI), University of Surrey
- Participants: Scientists (Academic & Research Staff, Journal Editors)
- Schedule:
  - Quality in Science
  - High/low quality
  - Standards and Proxies (origin and agency, establishment, settings, learning and application)

# *Questions & Comments*

**THANK YOU**