USER-DRIVEN QUALITY ASSESSMENT OF COST-ESTIMATING MODELS

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THE TRADITION OF "GOOD" ESTIMATION

- intellectual talk
  - evidence of accuracy, usually from previous projects
  - logic of structure
  - validity to all projects

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**THE TRADITION OF "GOOD" ESTIMATION**

- sales talk
  - street-cred: satisfied customers and (pretence of) rationale
  - uses "our language"
  - training and support
  - price

**THE TRADITION OF "... ..." ESTIMATION**

- what do the users want?

  (1) we're all different

  (2) we don't understand what they're talking about

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4-step Evaluation

(1) player profiling
   need list of features
(2) feature prioritisation
   need engineering characteristics
(3) measurement prioritisation
   need quality measures
(4) product comparison

Example: Model for Training

• introductory courses in estimation
• university courses in software engineering management

• Which model to use?

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**Step 1. Player Profiling**

- **Business:** management information, financial control, clients, etc.
- **Users:** experts and novice estimators, data collectors, etc.
- **Intellectual arguments**
- **Constraints:** technical, previous tools, etc.

**Player Profiling Training Example**

- **Business:** training staff
- **Clients:** examination boards
- **Users:** management training, estimator training, university education
- **Intellectual arguments:** academic
- **Constraints:** Win95, unit cost

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**Background:**

Need a List of Features

- lists for use in questionnaires, interviews and Delphi sessions
- features expressed in the language of the players

**List of Features**

Training Example

- features important to users:
  - answers! (signposts, structured learning)
  - reference cases (examples)
  - fit with their own experience
  - use: community and support
  - method and tool usable in their organisation
  - etc...

- features important to trainer:
  - etc...

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FEATURE PRIORITISATION

STEP 2.

**Feature Prioritisation**

- classify importance of each feature to each player (business, different users, etc)
  - e.g. critical, major, minor, not relevant
- consider each feature (don’t rely on maths)
  - voting systems ignore special cases and is distorted by the number/choice of players
  - compromise is expensive, and unachievable
  - trade-offs may be possible

TRAINING EXAMPLE

**Critical:**
- cost issues, trainer effort, p/c based

**Major:**
- learnability, describes “real world”

**Minor:**
- valid model, manuals, tool reliability

**Not Relevant:**
- technical support

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**Background.**

**Need Engineering Characteristics**

- users (etc.) talk about features and needs
- engineers talk about quality attributes

**Engineering Characteristics**

**Classifications of Quality**

- need a reusable list of measures
  - must be exhaustive, precise, versatile
  - consider model, tool, documentation
  - consider characteristics and measures
- ISO/IEC 9126.1
  - 21 "sub-characteristics" of product quality
  - in 6 groups ("classifications")
  - focus on the sub-characteristics

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**QUALITY CHARACTERISTICS**

- suitability, accuracy, interoperability, compliance, security [functionality]
- maturity, fault tolerance, recoverability [reliability]
- understandability, learnability, operability [usability]
- time behaviour, resource utilisation [efficiency]
- analyzability, changeability, stability, testability [maintainability]
- adaptability, installability, conformance, replaceability [portability]

**HOUSE OF QUALITY**

[Diagram of the House of Quality]

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PRIORITISATION

• measurement is expensive
  – used it to give confidence to customers
  – use it when there are risks to monitor
  – use it for performance analysis
• for others,
  take short-cuts
  – use simple measures of quality
  – evaluate features rather than measure quality

key characteristics (major and risky):
  – unit cost and interoperability (on Win95)
  – resource utilisation (of trainer)

lesser characteristics to measure:
  – learnability, understandability, operability
  – suitability, compliance (to "real world")
  – resource utiliation (of student)
USER-DRIVEN QUALITY ASSESSMENT OF COST-ESTIMATING MODELS

BACKGROUND:

QUALITY MEASURES

- measurement priorities
  - precision, e.g. number of significant figures
  - consistency with which values are measured
  - relevance to the quality characteristic
- costs
  - of performing measurement and collection
  - of getting started

QUALITY MEASURES: ACCURACY

- predictive accuracy: ERROR, PRED(25%)
- calibration accuracy: R², MRE, PRED(25%)
- project data accuracy: ERROR, PRED(25%)
- tool accuracy [implementation of model]

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QUALITY MEASURES:

LEARNABILITY

- extra time for first use:
  - includes training plus delays in first project
  - includes method and tool
  - consider different types of user

- availability of learning materials
  - introduction descriptions, training
  - on-line help (for method as well as tool)

QUALITY MEASURES:

RESOURCE EFFICIENCY

- availability of data for the estimate
  - time to collect new data

- time to perform estimates
  - for different types of estimate, project, person
  - include time spent on tool, writing reports, etc

- annual maintenance cost of estimating tool
STEP 4.
PRODUCT COMPARISON

- compare against a reference:
  - industry standards
  - comparable products

- use the selected cost measures

- example:
  - COSTAR vs USC C-II vs Foresight
  - compare COCOMO-2 vs COCOMO-81

USER-POWER:
QUALITY NOW!

We, the users, demand that

- quality is measured
- and the results displayed to us
- our time is not wasted
- our needs are considered

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