



University of Toronto Department of Computer Science

## Bias

- What is bias?
  - Bias only exists in relation to some reference point
    - can there ever be "no bias"?
  - All views of reality are filtered
  - All decision making is based partly on personal values.
- Types of bias:
  - Motivational bias
    - expert makes accommodations to please the interviewer or some other audience
  - Observational bias
    - Limitations on our ability to accurately observe the world
  - Cognitive bias
    - Mistakes in use of statistics, estimation, memory, etc.
  - Notational bias
    - Terms used to describe a problem may affect our understanding of it

### Examples of Bias

- Social pressure
  - response to verbal and non-verbal cues from interviewer
- Group think
  - response to reactions of other experts
- Impression management
  - response to imagined reactions of managers, clients,...
- Wishful thinking
  - response to hopes or possible gains.
- Appropriation
  - Selective interpretation to support current beliefs.
- Misrepresentation
  - expert cannot accurately fit a response into the requested response mode
- Anchoring
  - contradictory data ignored once initial solution is available
- Inconsistency
  - assumptions made earlier are forgotten
- Availability
  - some data are easier to recall than others
- Underestimation of uncertainty
  - tendency to underestimate by a factor of 2 or 3.

© Easterbrook 2004 5

University of Toronto Department of Computer Science

## Elicitation Techniques

- Traditional techniques
  - Introspection
  - Reading existing documents
  - Analyzing hard data
  - Interviews
    - Open-ended
    - Structured
  - Surveys / Questionnaires
  - Meetings
- Contextual (social) approaches
  - Ethnographic techniques
    - Participant Observation
    - Enthnomethodology
  - Discourse Analysis
    - Conversation Analysis
    - Speech Act Analysis
  - Sociotechnical Methods
    - Soft Systems Analysis
- Collaborative techniques
  - Focus Groups
    - Brainstorming
    - JAD/RAD workshops
  - Prototyping
  - Participatory Design
- Cognitive techniques
  - Task analysis
  - Protocol analysis
  - Knowledge Acquisition Techniques
    - Card Sorting
    - Laddering
    - Repertory Grids
    - Proximity Scaling Techniques

© Easterbrook 2004 6

University of Toronto Department of Computer Science

## Background Reading

- Sources of information:
  - company reports, organization charts, policy manuals, job descriptions, reports, documentation of existing systems, etc.
- Advantages:
  - Helps the analyst to get an understanding of the organization before meeting the people who work there.
  - Helps to prepare for other types of fact finding
    - e.g. by being aware of the business objectives of the organization.
  - may provide detailed requirements for the current system.
- Disadvantages:
  - written documents often do not match up to reality.
  - Can be long-winded with much irrelevant detail
- Appropriate for
  - Whenever you not familiar with the organization being investigated.

© Easterbrook 2004 7

University of Toronto Department of Computer Science

## "Hard Data" and Sampling

- Hard data includes facts and figures...
  - Forms, Invoices, financial information,...
  - Reports used for decision making,...
  - Survey results, marketing data,...
- Sampling
  - Sampling used to select representative set from a population
    - Purposive Sampling - choose the parts you think are relevant without worrying about statistical issues
    - Simple Random Sampling - choose every kth element
    - Stratified Random Sampling - identify strata and sample each
    - Clustered Random Sampling - choose a representative subpopulation and sample it
  - Sample Size is important
    - balance between cost of data collection/analysis and required significance
  - Process:
    - Decide what data should be collected - e.g. banking transactions
    - Determine the population - e.g. all transactions at 5 branches over one week
    - Choose type of sample - e.g. simple random sampling
    - Choose sample size - e.g. every 20th transaction

© Easterbrook 2004 8

University of Toronto

## Example of hard data

Questions:

- What does this data tell you?
- What would you do with this data?

**Agate**  
Campaign Summary

Date: 23rd February 1999

Client: Yellow Partridge  
Park Road Workshops  
Park Road  
Jewellery Quarter  
Birmingham B2 3DT  
U.K.

Campaign: Spring Collection 1999

Billing Currency: GB £

Item	Curr	Amount	Rate	Billing amount
Advert preparation: photography, artwork, layout etc.	GB £	15,000.00	1	15,000.00
Placement French Vogue	FFr.	47 000.00	11.35	4,140.97
Placement UK Vogue	GB £	5,000.00	1	5,000.00
Placement US Vogue	US \$	15,000.00	2.47	6,072.87
<b>Total</b>				<b>30,213.84</b>

This is not a VAT Invoice. A detailed VAT Invoice will be provided separately.

210-212 Carstairs Street, Birmingham B1 5TD  
Tel: 0121 111 2284 Fax: 0121 111 2245  
Email: agate@agatelltd.co.uk

© Easterbrook 2004

University of Toronto Department of Computer Science

## Interviews

- Types:
  - Structured - agenda of fairly open questions
  - Open-ended - no pre-set agenda
- Advantages
  - Rich collection of information
  - Good for uncovering opinions, feelings, goals, as well as hard facts
  - Can probe in depth, & adapt followup questions to what the person tells you
- Disadvantages
  - Large amount of qualitative data can be hard to analyze
  - Hard to compare different respondents
  - Interviewing is a difficult skill to master
- Watch for
  - Unanswerable questions ("how do you tie your shoelaces?")
  - Tacit knowledge (and post-hoc rationalization)
  - Removal from context
  - Interviewer's attitude may cause bias (e.g. variable attentiveness)

© Easterbrook 2004 Source: Adapted from Goguen and Linde, 1993, p154.

10

University of Toronto Department of Computer Science

## Interviewing Tips

- Starting off...
  - Begin the interview with an innocuous topic to set people at ease
    - e.g. the weather, the score in last night's hockey game
    - e.g. comment on an object on the person's desk: "My... what a beautiful photograph! Did you take that?"
- Ask if you can record the interview
  - Make sure the tape recorder is visible
  - Say that they can turn it off at any time.
- Ask easy questions first
  - perhaps personal information
    - e.g. "How long have you worked in your present position?"
- Follow up interesting leads
  - E.g. if you hear something that indicates your plan of action may be wrong,
    - e.g., "Could we pursue what you just said a little further?"
- Ask open-ended questions towards the end
  - e.g. "Is there anything else you would like to add?"

© Easterbrook 2004

11

University of Toronto Department of Computer Science

## Questionnaires

- Advantages
  - Can quickly collect info from large numbers of people
  - Can be administered remotely
  - Can collect attitudes, beliefs, characteristics
- Disadvantages
  - Simplistic (presupposed) categories provide very little context
    - No room for users to convey their real needs
- Watch for:
  - Bias in sample selection
  - Bias in self-selecting respondents
  - Small sample size (lack of statistical significance)
  - Open ended questions (very hard to analyze!)
  - Leading questions ("have you stopped beating your wife?")
  - Appropriation ("What is this a picture of?")
  - Ambiguous questions (I.e. not everyone is answering the same question)

Note: Questionnaires MUST be prototyped and tested!

© Easterbrook 2004 Source: Adapted from Goguen and Linde, 1993, p154.

12

University of Toronto Department of Computer Science

## Meetings

- ⇒ Used for summarization and feedback
  - ↳ E.g. meet with stakeholders towards the end of each stage:
    - to discuss the results of the information gathering stage
    - to conclude on a set of requirements
    - to agree on a design etc.
  - ↳ Use the meeting to confirm what has been learned, talk about findings
- ⇒ Meetings are an important managerial tool
  - ↳ Used to move a project forward.
  - ↳ Every meeting should have a clear objective:
    - E.g. presentation, problem solving, conflict resolution, progress analysis, gathering and merging of facts, training, planning,....
  - ↳ Plan the meeting carefully:
    - Schedule the meeting and arrange for facilities
    - Prepare an agenda and distribute it well in advance
    - Keep track of time and agenda during the meeting
    - Follow up with a written summary to be distributed to meeting participants
    - Special rules apply for formal presentations, walkthroughs, brainstorming, etc.

© Easterbrook 2004 13

University of Toronto Department of Computer Science

## Group Elicitation Techniques

- ⇒ Types:
  - ↳ Focus Groups
  - ↳ Brainstorming
- ⇒ Advantages
  - ↳ More natural interaction between people than formal interview
  - ↳ Can gauge reaction to stimulus materials (e.g. mock-ups, storyboards, etc)
- ⇒ Disadvantages
  - ↳ May create unnatural groups (uncomfortable for participants)
  - ↳ Danger of Groupthink
  - ↳ May only provide superficial responses to technical questions
  - ↳ Requires a highly trained facilitator
- ⇒ Watch for
  - ↳ sample bias
  - ↳ dominance and submission

© Easterbrook 2004 14

University of Toronto Department of Computer Science

## Joint/Rapid Application Development

- ⇒ JAD & RAD Principles:
  - ↳ Group Dynamics - use workshops instead of interviews
  - ↳ Visual Aids
    - Lots of visualization media, e.g. wall charts, large monitors, graphical interfaces
  - ↳ Organized, Rational Process
    - Techniques such as brainstorming and top-down analysis
  - ↳ WYSIWYG Documentation Approach
    - each JAD session results in a document which is easy to understand and is created and agreed upon during the session
- ⇒ Notes:
  - ↳ Choose workshop participants carefully
    - they should be the best people possible representing various stakeholder groups
  - ↳ Workshop should last 3-5 days.
    - Must turn a group of participants into a team - this takes 1-2 days.
    - Session leader makes sure each step has been completed thoroughly.
    - Session leader steps in when there are differences of opinion - "open issues".
    - Meeting room should be well-equipped for presentations, recording etc.

© Easterbrook 2004 15

University of Toronto Department of Computer Science

## Participant Observation

- ⇒ Approach
  - ↳ Observer spends time with the subjects
    - Joining in long enough to become a member of the group
    - Hence appropriate for longitudinal studies
- ⇒ Advantages
  - ↳ Contextualized;
  - ↳ Reveals details that other methods cannot
- ⇒ Disadvantages
  - ↳ Extremely time consuming!
  - ↳ Resulting 'rich picture' is hard to analyze
  - ↳ Cannot say much about the results of proposed changes
- ⇒ Watch for
  - ↳ going native!

© Easterbrook 2004 16

University of Toronto Department of Computer Science

## Ethnomethodology

- ⇒ **Basis**
  - ↳ **Social world is ordered**
    - The social order may not be obvious, nor describable from common sense
  - ↳ **The social order cannot be assumed to have an a priori structure**
    - Social order is established on a moment-to-moment basis through participants' collective actions (no pre-existing structures)
    - i.e. social order only observable when an observer immerses herself in it.
  - ↳ **Observation should be done in a natural setting**
  - ↳ **Need to consider how meanings develop and evolve within context**
- ⇒ **"Use the members' own Categories"**
  - ↳ **Most conventional approaches assume preexisting categories**
    - This may mislead the observer (e.g. appropriation)
  - ↳ **Ethnography attempts to use the subjects' own categories**
    - What categories (concepts) do they use themselves to order the social world?
  - ↳ **What methods do people use to make sense of the world around them?**
    - Use the same methods members use during observation
    - E.g. by developing a legitimate role within the community under observation.

© Easterbrook 2004 Source: Adapted from Goguen and Linde, 1995, p158. 17

University of Toronto Department of Computer Science

## Ethnomethodological approach

- ⇒ **Ethnomethodology is a subarea of Anthropology**
  - ↳ **Looks for behaviours that are culture-specific**
    - E.g. Frenchmen brag about sexual conquests to gain status;
    - E.g. Americans brag about money to gain status.
    - Each of these topics is taboo in the other culture
- ⇒ **Uses a very tightly controlled set of methods:**
  - ↳ Conversational analysis
  - ↳ Measurement of body system functions - e.g. heartbeat
  - ↳ Non-verbal behaviour studies
  - ↳ Detailed video analysis
  - ↳ **These techniques are useful in capturing information about a social setting.**
- ⇒ **Other observation techniques can be applied:**
  - ↳ **Time-motion study**
    - who is where, when?
  - ↳ **Communication audit**
    - who talks to whom about what?
  - ↳ **Use of tools - status symbols plus sharing rules**

© Easterbrook 2004 18

University of Toronto Department of Computer Science

## Knowledge Elicitation Techniques

- ⇒ **Protocol Analysis**
  - ↳ **based on vocalising behaviour**
    - Think aloud vs. retrospective protocols
  - ↳ **Advantages**
    - Direct verbalisation of cognitive activities
    - Embedded in the work context
    - Good at revealing interaction problems with existing systems
  - ↳ **Disadvantages**
    - Essentially based on introspection, hence unreliable
    - No social dimension
- ⇒ **Proximity Scaling Techniques**
  - ↳ **Given some domain objects, derive a set of dimensions for classifying them:**
    - step 1: pairwise proximity assessment among domain elements
    - step 2: automated analysis to build multi-dimensional space to classify the objects
  - ↳ **Advantages**
    - help to elicit mental models, where complex multivariate data is concerned
    - good for eliciting tacit knowledge
  - ↳ **Disadvantages**
    - Requires an agreed on set of objects
    - Only models classification knowledge (no performance knowledge)

© Easterbrook 2004 Source: Adapted from Hudlicka, 1996. 19

University of Toronto Department of Computer Science

## more KE techniques

- ⇒ **Card Sorting**
  - ↳ **For a given set of domain objects, written on cards:**
    - Expert sorts the cards into groups...
    - ...then says what the criterion was for sorting, and what the groups were.
  - ↳ **Advantages**
    - simple, amenable to automation
    - elicits classification knowledge
  - ↳ **Problems**
    - suitable entities need to be identified with suitable semantic spread across domain.
    - No performance knowledge
- ⇒ **Laddering**
  - ↳ **Uses a set of probes to acquire stakeholders' knowledge.**
    - Interview the expert.
    - Use questions to move up and down a conceptual hierarchy
    - E.g. developing goal hierarchies
  - ↳ **Advantages**
    - deals with hierarchical knowledge, including poly-hierarchies (e.g., goal trees, "is-a" taxonomies).
    - knowledge is represented in standardised format
    - can elicit structural knowledge
    - suitable for automation.
  - ↳ **Disadvantages**
    - assumes hierarchically arranged knowledge.

© Easterbrook 2004 20