

How to avoid impact from irrelevant and misleading information on your cost estimates

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München, 20 May, 2008

“Clouds Make Nerds Look Better”



- Sunshine increases tipping, impacts stock-market, and increases happiness.
- Study of university applicants:
 - 12% higher chance when sunshine compared to worst cloudcover.
 - Nerds had significantly higher chance compared to non-nerds on cloudy days.
 - Nerd-factor measured as academic rating divided by social rating (e.g., leadership).

Irrelevant information is everywhere ...

- Requirement specifications and other information provided in an estimation situation typically include
 - some misleading information (on purpose or accidentally)
 - much estimation irrelevant information
 - much information of low importance for the estimation work
- There are good (and not so good) reasons for this, e.g.,
 - information may be relevant for other purposes than effort estimation,
 - "copy-paste" of general information about the clients' processes and organization from previous specifications,
 - lack of competence in how to write a good requirement specification
- Are we more rational than stock investors and university applicant assessors, or do we get impacted by irrelevant information?

The impact of the # of pages ...

- Computer science students estimated the effort of the same programming task.
 - Group A: Received the original specification, which was one page long.
 - Group B: Received a version of the specification that had exactly the same text, but was seven pages long. The increased length was achieved through double line space, wide margins, larger font size and more space between paragraphs.

The impact of the # of pages ...

- Group A and B's estimates were, on average, 117 and 173 work-hours, respectively.
 - Longer specification → higher estimates.

This effect is fortunately not very large in “the field” (software professionals in outsourcing companies, normal estimation processes)

The Effect of the Reduced Length of Specification

Group	Median
Manipulated (3 pages spec.)	295 work-hours (n=24)
Ordinary (12 pages spec.)	330 work-hours (n=22)

Effect seems to be reduced with more time spent and higher expertise, but still there ...

Adding irrelevant information ...

- The software professionals in Group A received the original programming task specification.
- The software professionals in Group B received the same specification
 - Added estimation irrelevant information about the end users desktop applications, web design, user passwords, etc.

Adding irrelevant context information ...

- Results:
 - Group A average: 20 work-hours
 - Group B average: 39 work-hours
- Large impact!

Anchoring experiment ...

- HIGH (LOW) group: *“The customer has indicated that he believes that **1000 (50)** work-hours is a reasonable effort estimate for the specified system. However, the customer knows very little about the implications of his specification on the development effort and you shall not let the customer’s expectations impact your estimate. Your task is to provide a realistic effort estimate of a system that meets the requirements specification and has a sufficient quality.”*
- Software professionals as estimators. (Participants on an estimation seminar.)

Anchoring experiment ...

- *Results:*
 - HIGH anchor group average: 555 work-hours
 - CONTROL group (no anchor) average: 456 work-hours
 - LOW anchor group average: 99 work-hours
- *None felt they had been much impacted, and most of the software professionals claimed that they had not been impacted at all.*

Field study (with outsourcing companies)

The following text was included early in the manipulated requirement specifications: *“The preliminary budget of the new system is \$10 000 [corresponding to about 100 work-hours with typical pricing in the country in which it will be built]. The preliminary budget is not built on any knowledge about the actual cost of developing the new system, and will, if needed, be extended to cover the expenses necessary to build a quality system with the desired functionality.”*

100 work-hours is a very low value for the project and the companies were instructed to not use this as input to their effort estimate.

Field study (with outsourcing companies)

Numerical Anchor

Group	Median estimate
Manipulated (client's expectation, 100 work-hours)	724 work-hours (n=23)
Ordinary	956 work-hours (n=23)

Why are they/we like this?

- Hot topic among researchers. We do not know very much.
- The “enabler” is that brain activity is mainly unconscious, i.e., we are not in control of most of our thought processes and attention.

Example: The Cocktail Party Effect



So, we are in many ways not in control ...



- The lack of total brain control implies that it is hard to defend positions like:
 - “I know why I like what I like”
 - “My estimate is based on information X”
 - “I will not be impacted in my judgment by a dinner with one potential providers”
- This is, however, what most people seem to do.
- The reason for our unwillingness to accept the lack of control may be a strong desire to believe that we are rational individuals.
 - Ironically, the rational reaction to our lack of control is to admit irrationality.

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We cannot be that irrational, or we would have been extinct ...



- Research studies tend to focus on judgmental biases, not when our judgments are good, i.e., the picture derived from the research is strongly biased towards demonstration of poor performance.
- The effect of irrelevant information is a consequence of high performance tailored (evolved) to other, much more important, situations (survival and reproduction) combined with the relatively slow speed of mental activities and neural speed:
 - Information received: ~ 10 Mbit/sec
 - Information processed consciously (working memory): ~ 40 “bit”/sec?
- If the working memory (the conscious part of our brain) should do all processing work, we would not be able to walk and talk at the same time - probably not even walk or talk.

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What we definitely should avoid ...

- Exposure to obviously irrelevant information, e.g., customer expectations that will have the role as anchors in effort estimation situations.
- A belief that the impact from irrelevant information only happens to other than yourself.
- Information that “dilutes” the impact from the most essential information.
 - Much evidence to support the claim that more information of lesser quality or relevance typically leads to too little emphasis on the most relevant information.

Example: A dilution effect experiment

Software professionals were asked to weight the importance of estimation model selection factors. A 20% weight meant, for example, that the score of a model on that factor would count 20% of the evaluation. The sum should be 100%.

The factors were:

1. Accuracy of the estimates
2. Ease of understanding the model
3. Ease in use of the model
4. The model uses only easy available data
5. The method is flexible and possible to use when not all input data are available
6. The method provides minimum-maximum intervals
7. Other factors

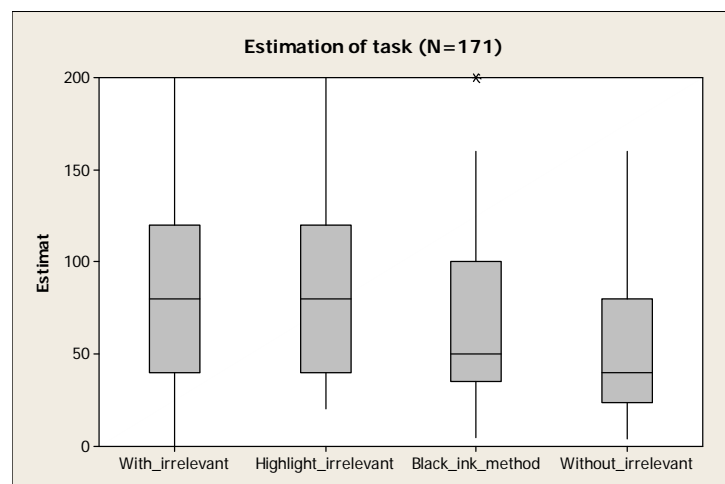
Group A had a reduced list of factors (Factors 1-3 + 7), while **Group B** had all seven factors.

The most important factor (Factor 1) had the weight 40% in Group A, while “diluted” to only 24% in Group B.

Debiasing techniques ...

- Awareness of own biases does not help directly, but indirectly in that other less vulnerable judgment processes are chosen.
- Analytic, as opposed to intuition-based, estimation processes helps.
 - But, even formal estimation models take expert judgment as input.
- The “black-ink method” (see next slide) may help, but not very much.
- Debiasing techniques are typically the second best option.
- The only really effective method is to **remove** the irrelevant and **re-formulated** (neutralized) the potentially misleading, estimation relevant information.

The “Black Ink”-method experiment



The removal/reformulation approach (Published in IEEE Software May/June 2008)

Step 1: Let another person than those estimating the effort develop a “package” of the requirement specification and other estimation relevant information where misleading, irrelevant and non-essential information have been removed and/or re-formulated (neutralized).

NB 1: Relevance should be measured in relation to most likely use of effort (Purpose: realism) and **not** relative to what should be the planned effort (Purpose: project control), the bid or price (Purpose: Profit) or the budget (Purpose: Budget control). This step implies a stronger separation of planning, analysis/design and estimation work.

NB 2: Most of the removed information is probably highly relevant for other tasks, e.g., knowing as much as possible about the clients expectations is useful for bidding purposes.

The removal/reformulation approach

Step 2: Use the filtered information when applying and combining, as independently as possible, estimation approaches based on, both:

- Outside view (looking back on similar projects)
- Inside view (bottom-up, WBS)

NB 1: Ensure that everybody involved clearly understands that the purpose of the estimation work is to derive the most likely use of effort, and the plan or a bid.

NB 2: If a person knows anything about the desired outcome of the estimation process or other biasing information, this person should be excluded from the estimation work.

The removal/reformulation approach ...

Step 3: Read through the relevant, but not essential information to examine the need for adjustment.

NB 1: No adjustment should be allowed unless **very good** argumentation.

NB 2: If the estimate is “too high”, the solution is to remove functionality or simplify solution, **not** to adjust the estimate. The process of removing and simplifying should follow the same principles as outlined for the first estimate.