

**Tutorial: Evaluation of
Information Technology
in Health Care,**
.....

Jytte Brender
Associate Research Professor

jytte.brender@v-chi.dk

Virtual Centre for Health Informatics & Aalborg University

CONTENTS

Introduction of:

- a) how to choose an adequate study design
- b) available methods and tools
- c) typical pitfalls & perils in evaluation studies

"A perspective does not determine the answers
to design questions
but guides design
by generating the questions to be considered"

(Winograd and Flores cited by [Kukla et al. 1992])

Users' domain knowledge is tacit and elusive

... and so is that of every other professional, incl. the method builders

Evaluation

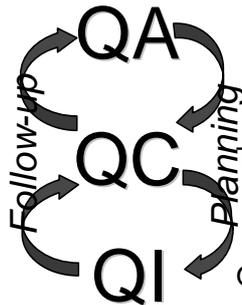
*is the act of
measuring or exploring properties
of a health information system
(in planning, development, implementation, or operation),*

*the result of which informs a decision to be made
concerning that system in a specific context*

[Ammenwerth et al. 2004]

How to choose an adequate study design

Quality management framework



Strategic level ('why')

Analysis of **objectives, conditions/constraints** and **policy** (incl. value norms and preferences), to establish a **strategy and guidelines** for accomplishment of a solution/task, including overall **selection of methods**

Tactical level ('how')

Prepare the QA choices & information on the actual case, i.e. **establish the basis for the practical application** of the methods, including adaptation of the selected methods

Operational level ('who, what, where, when')

Implements QA and QC in terms of concrete **procedures, prescriptions and tools**

Analysis of objectives, conditions/constraints and policy (incl. value norms and preferences), to establish a strategy and guidelines for accomplishment of a solution/task, including overall selection of methods

It is so important...

What and how to do? ... that there is full compliance between

- aim,
- approach and
- actual usage of the study outcome



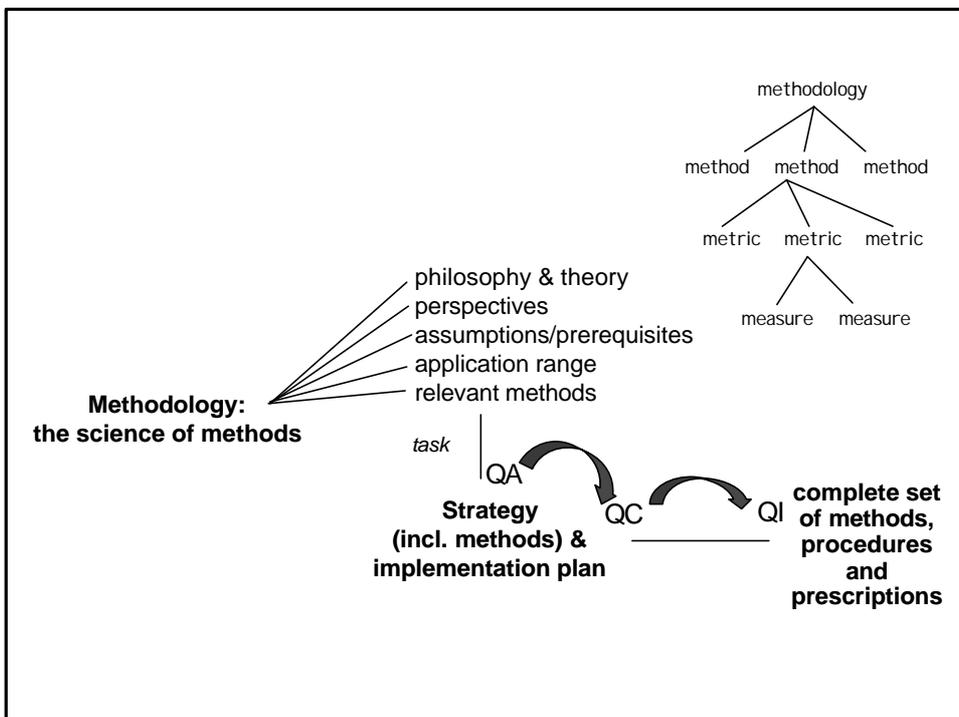
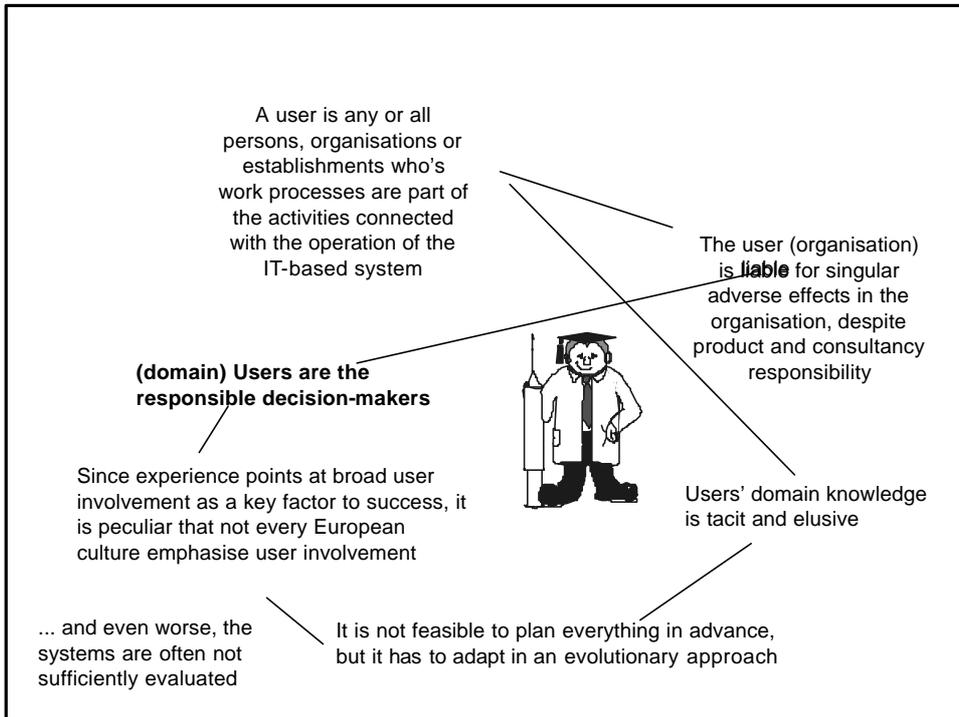
The strategic level (1)

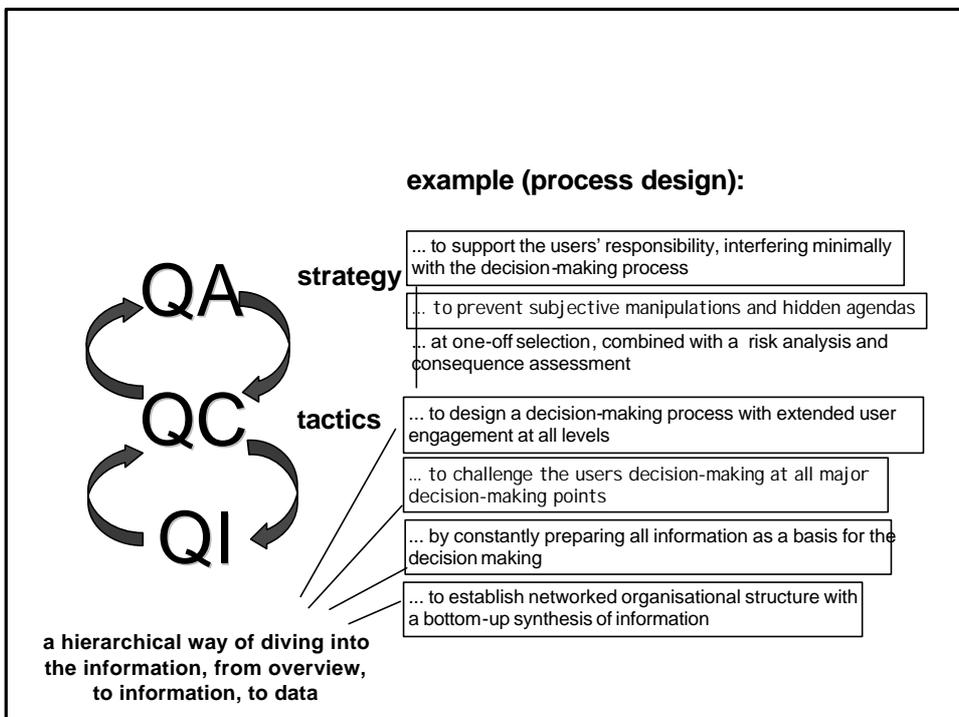
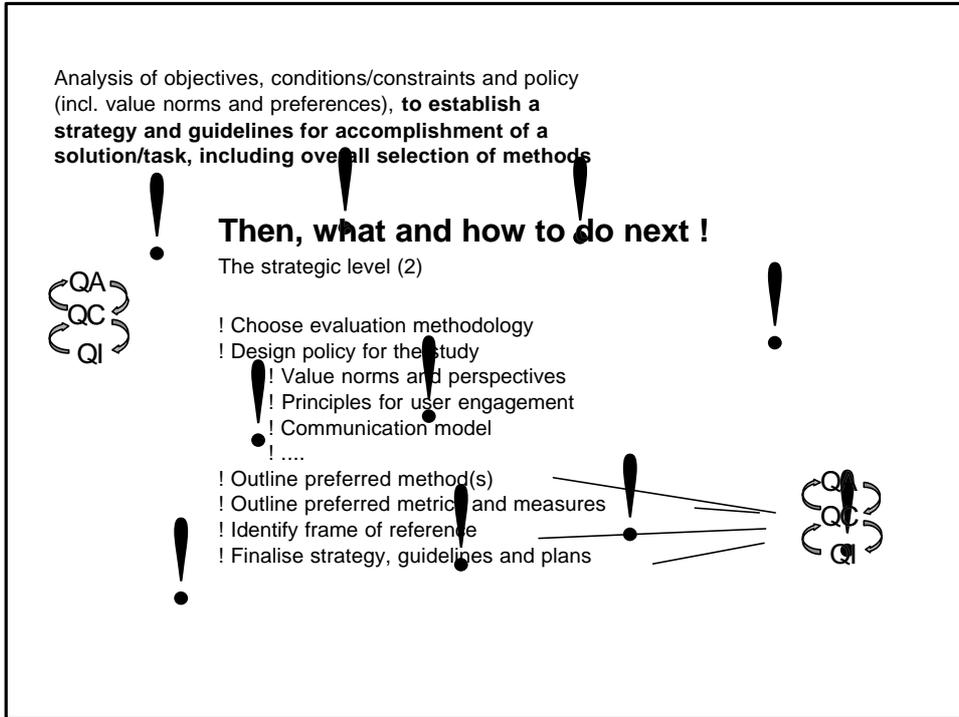
- ? What is the question that the evaluation needs to answer
- ? Where are you within the lifecycle
- ? What - precisely - is the outcome going to be used for
- ? Who is the target group of that information

- ? What is the context of the study
 - ? Vision and mission of the organisation
 - ? Its policy
 - ?

It is equally important...

- ? What are the conditions and constraints
 - ? Resources available
 - ? Feasible approaches
 - ? Relevant baseline material
- ... that the preconditions of the organisation are known and respected

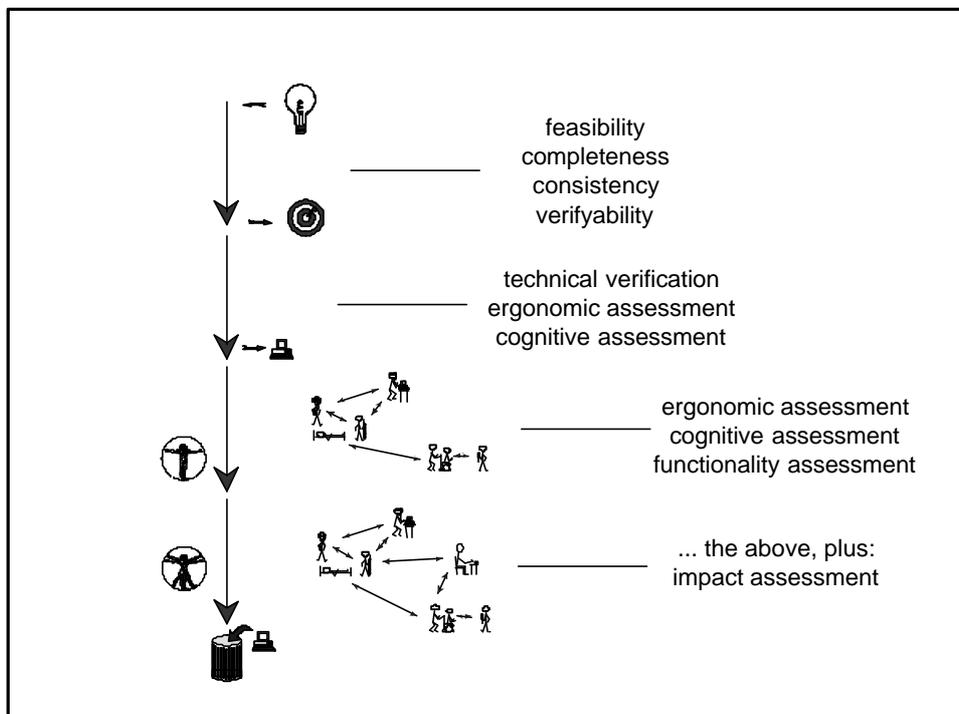




Available methods and tools

... introduction

- 1) What to look for when searching for a suitable method?
- 2) Inventory of methods



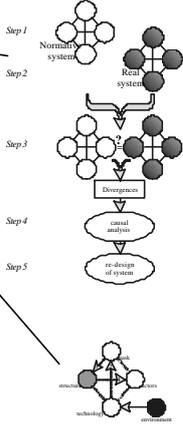
icons that together characterises the assessment method's application area within the lifecycle of the IT-system, including the applicability for the mentioned purpose.

<method name>		☺☺
Application area:	The method's application area is concerned with what it may be applied for.	
Description:	What does the method include and how is this accomplished.	↔ ☑
Assumptions for application:	Necessary (non-trivial) conditions for application of the method with a useful result.	
Perspectives:	Aspects – like the philosophy behind the method, including hidden assumptions – of importance for the accomplishment or the interpretation of results.	🎯 ✂️ 🚶 🚶
Frame of reference:	What might serve as the frame of reference.	
Pitfalls and perils:	Where, how and why one may risk specific pitfalls or perils.	
Tips and comments:	Small tricks/advices that may help the accomplishment of the investigation or how to modify the method.	
References:	A complete list of references used from the literature, and of supplementary valuable references.	

Questionnaires		☺☺ § (§§) €€
Application area:	has been used to ask for almost anything, but should primarily be used to elicit qualitative investigations of subjective aspects	🎯 🚶 🚶
Description:	may different types of questions that may be combined at random	↔ ☑
Assumptions for application:	validation of the questions, and use of the right analysis tools	
Perspectives:	"Everyone can formulate questions"	
Frame of reference:	Depends on the purpose of the study	
Pitfalls and perils:	<ul style="list-style-type: none"> • internal validity • context of response • psychological aspects • linguistic aspects • cultural aspects • who to ask 	
Tips and comments:		
References:		

Functionality Assessment ☺ ☺ §§ €€€

Application area: validation of objectives fulfilment • impact/effect assessment • id. of problems in IT <-> organisation interaction	
Description:	
Assumptions for application:	• information access • diagramming experience
Perspectives:	• the organisation changes dynamically • Leavitt's model for organisational change • Mumford's model for Participative Design
Frame of reference:	<i>Built into the method</i>
Pitfalls and perils:	The causal analysis is vulnerable, because it may be difficult to access/elicit/verify the true causal mechanisms
Tips and comments:	1. Other frameworks may be applied, like structure, process, outcome 2. Any diagramming technique may be applied
References:	Brender J. Methodology for Assessment of Medical IT-Based Systems, IOS Press Vol 42, 1997



Inventory of methods

Method	Application purpose
Assessment of bids	A set of techniques for comparative assessment of bids
Balanced Scorecard	Strategic management
BIKVA	Critical, subjective assessment of an existing practice
Clinical/diagnostic performance	Measurement of diagnostic accuracy and precision
Cognitive assessment	<ul style="list-style-type: none"> • Identification of where and why operation errors occur • Identification of focus point for improvement of user friendliness and usability
Delphi	<ul style="list-style-type: none"> • Trends assessment • Assessment of the future
Cognitive walkthrough	<ul style="list-style-type: none"> • Assessment of system design and early prototypes • Assessment of demos

Method	Application purpose
Effect assessment	Combined assessment of degree of objectives fulfillment and of side effects (impact assessment)
Field study	Observation of and within an organisation to identify practice and mechanisms controlling change
Focus Group Interview	<ul style="list-style-type: none"> • Elicitation of patterns of attitudes, ways / modes of acting within/among social groups • Elicitation of problem areas within the organisation or the IT-based solution.
Framework for assessment of strategies	Comparative judgement of development strategies
Functionality assessment	Assessment of objectives fulfilment, and identification of focus points for change
Grounded Theory	Text-analysis
Future Workshop	Situation analysis aimed at identification of focus points for change

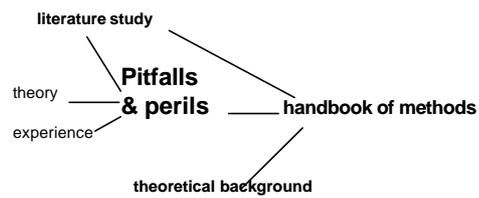
Method	Application purpose
Heuristic evaluation	(anything)
Interview	Exploration of individuals' attitudes, opinions, and perception of phenomena and observations
KUBI	Incremental optimization of outcome to comply with policy and aim.
Logical Framework Approach	Situation analysis, aiming at identifying focus points for change
Modelling of work procedures	Impact Assessment
Pardizipp	Identification of future scenarios
Prospective time studies	Measurement of trends, in particular effect of a specific initiative
Requirements Assessment	Assessment of a User Requirements Specification
Questionnaires	Qualitative investigations of subjective aspects, like attitudes and opinions

Method	Application purpose
RCT	Evaluation of efficacy, i.e. that the IT-system – under ideal circumstances – improve patient care.
Risk Assessment	Monitoring of risk aspects
Social network analysis	Assessment of relations between elements in an organisation, influencing acceptance and use of future solutions
Stakeholder analysis	Assessment of who to involve
SWOT	Situation analysis
Technical verification	Systematic assessment of requirements fulfilment as part of an acceptance trial
Usability	Assessment of user friendliness in terms of ergonomic aspects
User acceptance and satisfaction	Assessment of opinions, attitudes and perceptions
Video recording	<ul style="list-style-type: none"> • Analysis of complex patterns of interaction • Data acquisition and documentation in general

Misc.	Application purpose
Documentation in an accreditation or certification situation	Aspects of concern when being or aiming at accreditation or certification
Metrics and measures	Established measuring points
Standards	Numerous prescriptive guidelines of relevance for assessment projects.

(Typical) pitfalls and perils

Pitfalls and perils were identified within the medical and social sciences



- all have analogues at experimental assessment of IT-based solutions within the healthcare sector

Concepts:

Strengths

Basics in planning, plus explicitness of fault preventive measures / initiatives within the study **design**

Weaknesses

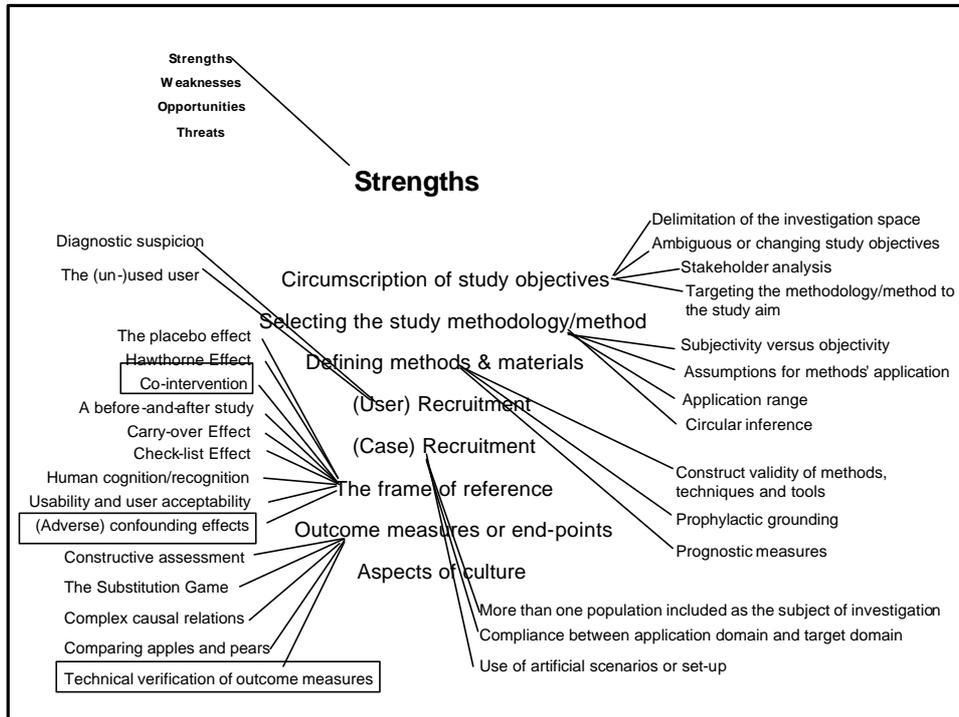
Inventory of perils & pitfalls to be considered at the **data collection, analysis or interpretation**

Opportunities

Options for problem solving after the event, i.e. extension of data analysis or further data collection

Threats

Synthesis and risk assessment regarding the study **conclusion**



(Adverse) confounding effects

"it is always possible that a variable, other than the independent variable has produced the effect"

Case (van Gennip & Bakker 1995):

- before & after study
- three hospitals each with two matched pairs of wards
- one hospital used computer literate users, the others illiterate users

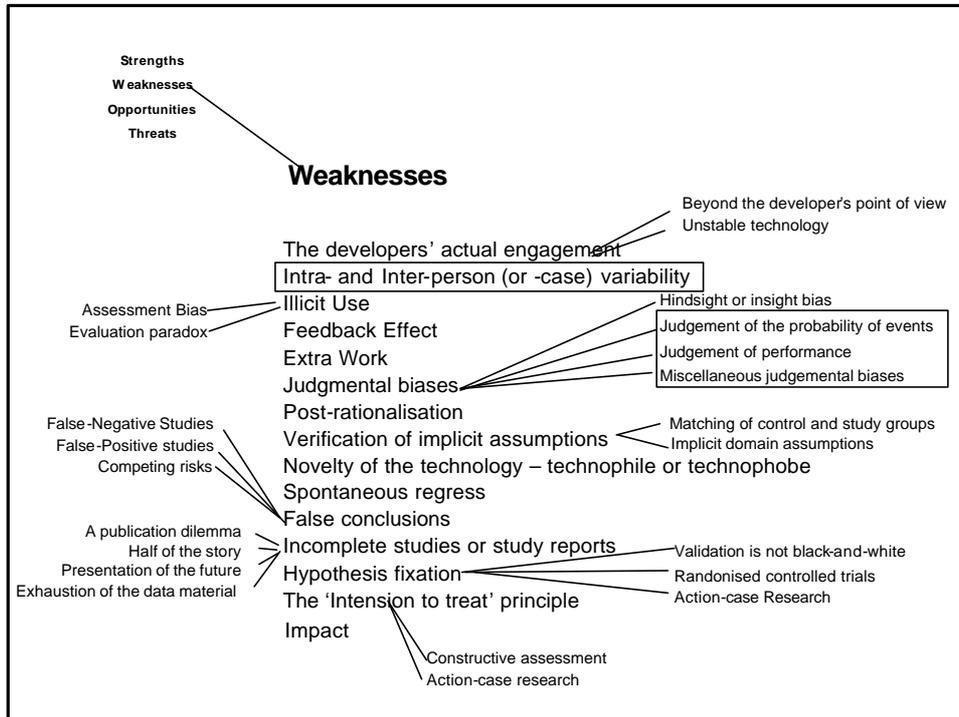
The literate users immediately started changing working practice !

Another case:

Improvement of effectiveness implies

- > number of bed days reduce
- > more patients treated
- > higher workload on diagnostic efforts
- > changed resource patterns
- > reduced waiting lists -> less acute cases -> another patient stream

.....



Intra- and Inter-person (or -case) variability

People are different,
 professional practices are different,
 organisations are different,
 cultures are different

Consequently,
 the inter- / intra-person (or case) variation
 is a serious issue,
 implying that the study is vulnerable to
 population size and characteristics

Judgemental biases

Human judgement is not always reliable:

- judgement of probabilities differ from empirical observations
- judgement of performance is skewed
- judgement of probability of tied events impaired
- judgement of positive and negative statements differs
- judgement of expected events are rated higher than unexpected events

.....

... and then what is ...

The practical implication?

It may mean

- everything!

- or nothing!

**Flaws may completely ruin a study
- examples**

Triangulation proves that one cannot trust the users' statements

Two presentations on the same IT-system had opposite conclusions

Some uses t-test for verification of the significance at questionnaire studies with ordinal ratings

**Flaws may have no or minor implication
- examples**

The users don't do as they say they do, ... but does this matter when it is their reality that has to be judged for the IT-system?

If the users express that an IT-system is good, does it then matter that someone can prove the opposite?

You cannot – with sense – compare just anything

A lot of the pitfalls and perils have no or marginal effect in a given evaluation study

The End

jytte.brender@v-chi.dk