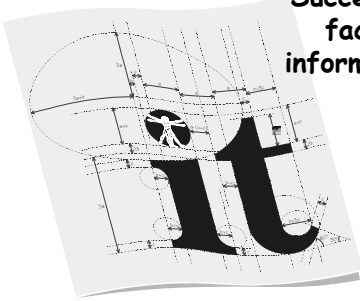


"Success and failure factors in health information systems development"



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Factors influencing success and failure of Health Informatics Systems, a pilot Delphi study

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Indicating the width of aspects that needs to be taken into account at the preparation of an evaluation plan for a project.

What is 'evaluation'?

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]

Another key in that definition is 'system'

A system is "All the components, attributes and relationships needed to accomplish an objective"
[Haimes & Schneiter 1996]



Metaphorically speaking, evaluation is like a torch being waved in the dark in front of you,

- **screening** for options, obstacles and barriers,
- **diagnosing** problems within a vast of observations,
- **prognosticating** risks, while
- **monitoring** performance indicators,

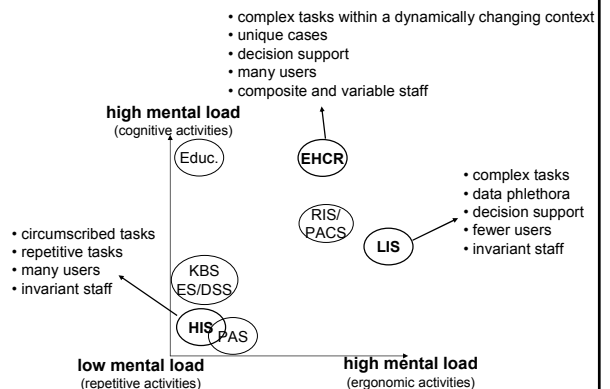
but NOT:

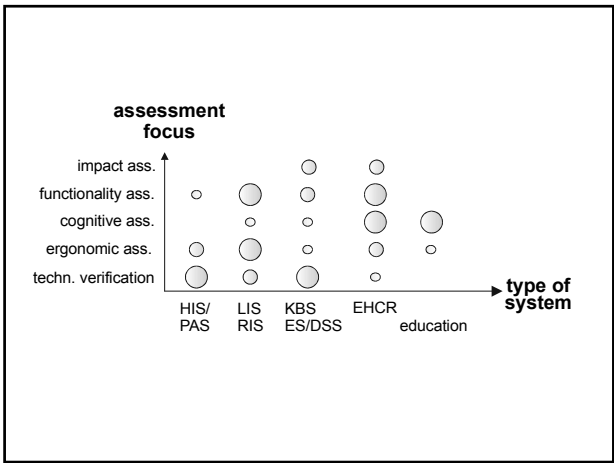
- **treating** identified obstacles and symptoms of failure

Consequently, evaluation is seen as a means for the project management to:

- maximise success
- minimize failure

by providing the decision-making basis





Available methods and tools
 ... introduction to an inventory of methods

Inventory of methods

Method	Application purpose
Analysis of Work Procedures	Assessing what actually happens compared to the expectations of what should happen
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
Cognitive Walkthrough	<ul style="list-style-type: none"> • Assessment of system design and early prototypes • Assessment of demos

Method	Application purpose
Delphi	<ul style="list-style-type: none"> • Trends assessment • Assessment of the future
Equity Implementation Model	Examine users' reaction to the implementation of a new system
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 fulfillment, and identification of focus points for change

Method	Application purpose
Future Workshop	Situation analysis aimed at identification of focus points for change
Grounded Theory	Text-analysis
Heuristic Evaluation	(directed at usability assessment)
Impact Assessment	Combined assessment of degree of objectives fulfillment and of side effects (impact assessment)
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

Method	Application purpose
Organisational Readiness	An organization's readiness to assimilate a clinical information system
Pardizipp	Identification of future scenarios
Prospective Time studies	Measurement of trends, in particular effect of a specific initiative
Questionnaires	Qualitative investigations of subjective aspects, like attitudes and opinions
RCT	Evaluation of efficacy, i.e. that the IT-system (under ideal circumstances) improves patient care
Requirements Assessment	Assessment of a User Requirements Specification
Risk Assessment	Monitoring of risk aspects
Root Causes Analysis	Exploration of what, how and why a given incident occurred to identify the root causes of undesirable events

Method	Application purpose
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
Think Aloud	Gaining insight into the cognitive processes
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

There are plenty of methods and frameworks, and a fair number of methodologies to address users' need for evaluation

Delphi Study:

Initial input: MIE 2004STC conference focused on success and failure criteria

- proceedings
- presentations
- mind maps of the presentations

C Initial Questionnaire aimed at qualitative feedback

C Final Questionnaire with quantitative ratings

Results:

A total of 110 success factors and 27 failure criteria were identified, distributed on:

Categories:

- functional
- organisational
- behavioural
- technical managerial
- political
- cultural
- legal
- strategy
- economy
- education
- user acceptance

System types:

- Administrative systems
- Production Support Systems
- Clinical Systems
- Decision Support Systems
- Education & Training Systems

Scoring system for success factors

• "Essential for the success of a Health Informatics Application"

• "Central for success in most cases"

• "Important for success in general"

• "Sometimes relevant for success in general"

• "Not really important for the success of Health Informatics Applications"



Success factors (fraction of the rating)

	AS	PSS	CS	DSS	ES
Fraction of 'Essential'	0.30	0.34	0.41	0.41	0.36
Fraction of 'Central'	0.35	0.33	0.37	0.30	0.30
Fraction of 'Important'	0.23	0.22	0.16	0.20	0.21
Fraction of 'Sometimes relevant'	0.11	0.09	0.05	0.07	0.12
Fraction of 'Not really important'	0.02	0.01	0.01	0.02	0.01

Functional aspects

- ❶ Careful preparation of the User Requirements
Specification to appropriate and balanced take into account and express users' requirements, needs as well as demands
- ❶ Alignment of the role and design of the IT-system
 - PSS
 - CS
 - Fulfill the needs (whether stated or not) rather than only the requirements of the users
 - The functionality has to be compatible with the users' way of thinking (cognitive aspects)
- ❶ Coping with the complexity
 - The system has to be usable and useful, helping the user in his/her daily routine workable and allow ongoing extension, while carefully controlling the aspect of changes in the organisational context
 - Have to comply with the organisational context, including structure, people, information flow and external links
- ❶ Flexibility towards dynamic changes and changes in the organisational context
- ❶ Added functionality are provided by the IT-system, enabling users to provide new or better services
 - The functionality has to be compatible with the users' way of thinking (cognitive aspects)

Organisational aspects

... that may need evaluation

Work from the workflow

Planning of new procedures must appropriately take existing patterns of collaboration into account
 Social Networks Analysis

The users show a willingness to change practice
 Organisational Readiness

Behavioural

The personal attitude, engagement and commitment

Users
 Managers
 Other stakeholders

Stakeholder Analysis

Culture

Preparedness and willingness towards cultural change

Awareness of the need for cultural change
Readiness for a potential new business model
Readiness for solutions not invented in-house
 Organisational Readiness

Management

Management support
 Setting goals and courses
 Understanding the return of investment (whether material and/or immaterial benefits)
 Economic assessment

Flexible planning
 Realistic time lines
 Understanding that implementation of an IT-based solution is a non-linear (indeterministic) process
 Response to shortcomings is constructive
 Even-tracing approaches, like Root Causes Analysis

Prospective and proactive control
 Stringent risk management
 Appropriate action in response to unanticipated events
 Risk Assessment
 Root Causes Analysis

User involvement

Strategy
 Synergy between initiatives
 Analysis of lines of communication
 Framework for Assessment of Strategies;

Handling the diversity within stakeholder goals
 Awareness and mediation of diverging goals
 Handling of hidden agendas
 Stakeholder Analysis

Technical aspects

Standard based

Data validity procedures are part of system qualities

Usability ... a number of usability approaches

Integrated functionality
 Integration with legacy system
 Interoperability (i.e. connected systems are logically and functionally co-operating in real-time)

Communication standards
 Interconnectivity

Flexibility and adaptability, enabling future functional and technical changes

Technical Verification

Legal aspects

Know what the legal constraints /opportunities are

Strategy

Organisational Framework for Assessment of Strategies
Accepted also at lower levels Focus Group Interviews

Economy

There has to be a return of investment
(whether material or immaterial)

User acceptance

usually: Questionnaires

Failure criteria

1. "Essential in order to avoid a failure for a Health Informatics Application"
2. "Central in order to avoid a failure in most cases"
3. "Important in order to avoid a failure in general"
4. "Sometimes relevant in order to avoid a failure"
5. "Not really important for failures of Health Informatics Applications"

Failure criteria (fraction of the rating)

	AS	PSS	CS	DSS	ES
Number of 'Essential'	0.24	0.28	0.40	0.40	0.27
Number of 'Central'	0.36	0.32	0.27	0.27	0.21
Number of 'Important'	0.29	0.31	0.27	0.20	0.19
Number of 'Sometimes relevant'	0.10	0.09	0.06	0.14	0.33
Number of 'Not really important'	0.01	0.01	0.01	0.00	0.00

Functional aspects

The system does not meet expectations Functionality Assessment
Root Causes Analysis

Limitations in the way the user can express his/herself
Analysis of work procedures
Field Study
Usability approaches

Organisational aspects

Not understanding the organisational context
Not understanding or foreseeing the extent to which the new IT-system affects the organisation, its structure and/or work procedures
(Future Workshop)
Too many changes of work procedures

Analysts dominate the development at the expense of those understanding the organisational context Stakeholder Analysis

Behavioral

Overloading the user Usability

Underestimating user acceptance User Acceptance

Resistance because of fear or loss of control of own job situation Focus Group Interview

Cultural

Assuming that what works at one place also works somewhere else Analysis of Work Procedures
Functionality Assessment

Users have too high expectations Interviews

Technical

Usability

Limitations in the way the user can express his/herself

Response rate and other performance measures

The time needed to complete the users' tasks is increased
(time measurements)

Vendor did not support the functionality quoted

Insufficient verification of conformity with requirements specification Techn. Verification

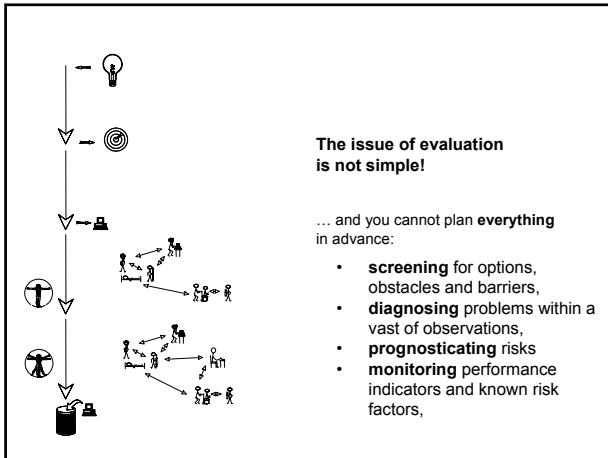
Legal

Low concern on regulations and standards

Compliance with laws and existing ethical rules of conduct

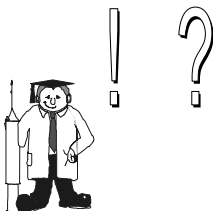
Education

Visible discrepancy between successive versions of the IT-system



Open problems:

- system development is indeterministic
- problem space and solution space is unlimited
- transformation
 - evaluation is a creative task
 - requires methodological and methodical expertise
- natural variation
 - complexity
 - dynamics
 - multimethod approaches
 - evolution of evaluation methods



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<http://iig.umit.at/efmi/>