How IT Security Awareness Should be Tested

Arnold Sykosch: *sykosch@cs.uni-bonn.de*
Matthias Wübbeling: *wueb@cs.uni-bonn.de*

Friedrich-Wilhelms-Universität Bonn: Working Group IT Security

Fraunhofer Institute for Communication, Information Processing and Ergonomics FKIE: Cyber Security Department

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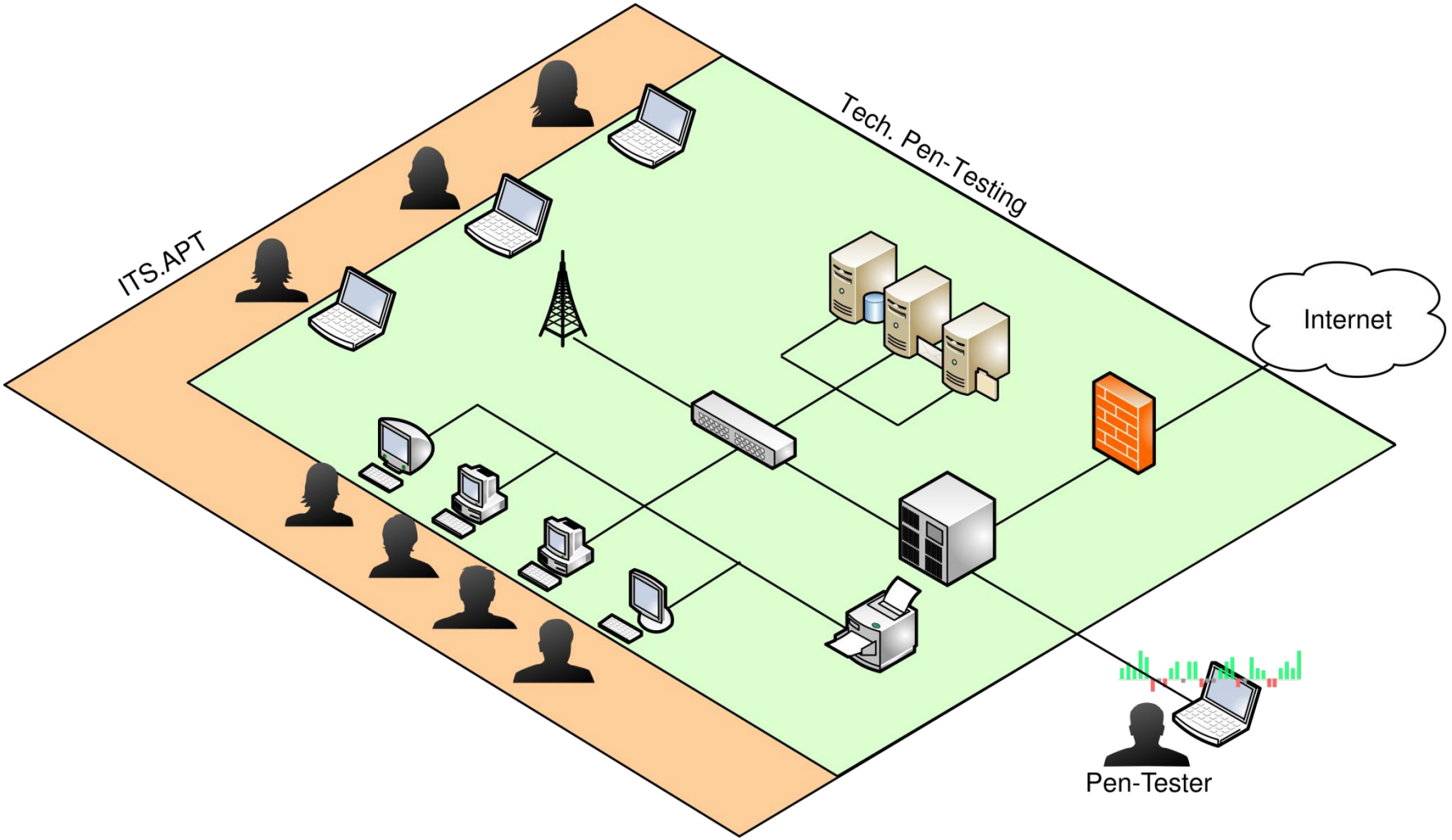
Overview

- The Idea
- IT Security Awareness
- Quantification

The Idea

- There are a lot of training efforts.
  Goals include, but are not limited to:
  - Increase of incident reports by users.
  - Decrease of incidents.
  - *Change human behavior.*
  - ...
- Evaluation is recommended ...
  - ... but instructions are (usually) missing.

The Idea



ITS.APT: IT Security Awareness Penetration Testing

ITS.APT: The Project

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Federal Ministry of Education and Research

- 6 Partners:
  - Security Researchers
  - Security service provider
  - Privacy officer
  - Psychologists
  - Lawyers
  - Operator of a critical infrastructure
- Start: 1. January 2015
- End: 31. December 2017
- https://itsec.cs.uni-bonn.de/itsapt

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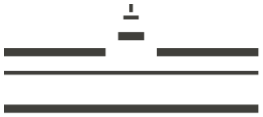

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ERNW providing security.

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Unabhängiges Landeszentrum für Datenschutz Schleswig-Holstein

ITS.APT: The Project

- Project Goals:
  - A tool to measure IT security awareness (tech)
  - Recommendation for action (law)
  - Privacy concept (privacy officers)
  - Concept to derive awareness from behavior (psychology)
  - Training concept (security service)
  - Evaluation (operator)

Cherry Picking IT Security Awareness Definitions

"information security awareness [is] *used to refer to a state where users in an organization are aware of* [...] *their security mission (often expressed in end-user security guidelines)."*[1]

"Awareness is the degree or extent to which every member of staff understands: the importance of information security, the levels of information security appropriate to the organisation, their individual security responsibilities and acts accordingly."[2]

"Awareness is not training."[3]

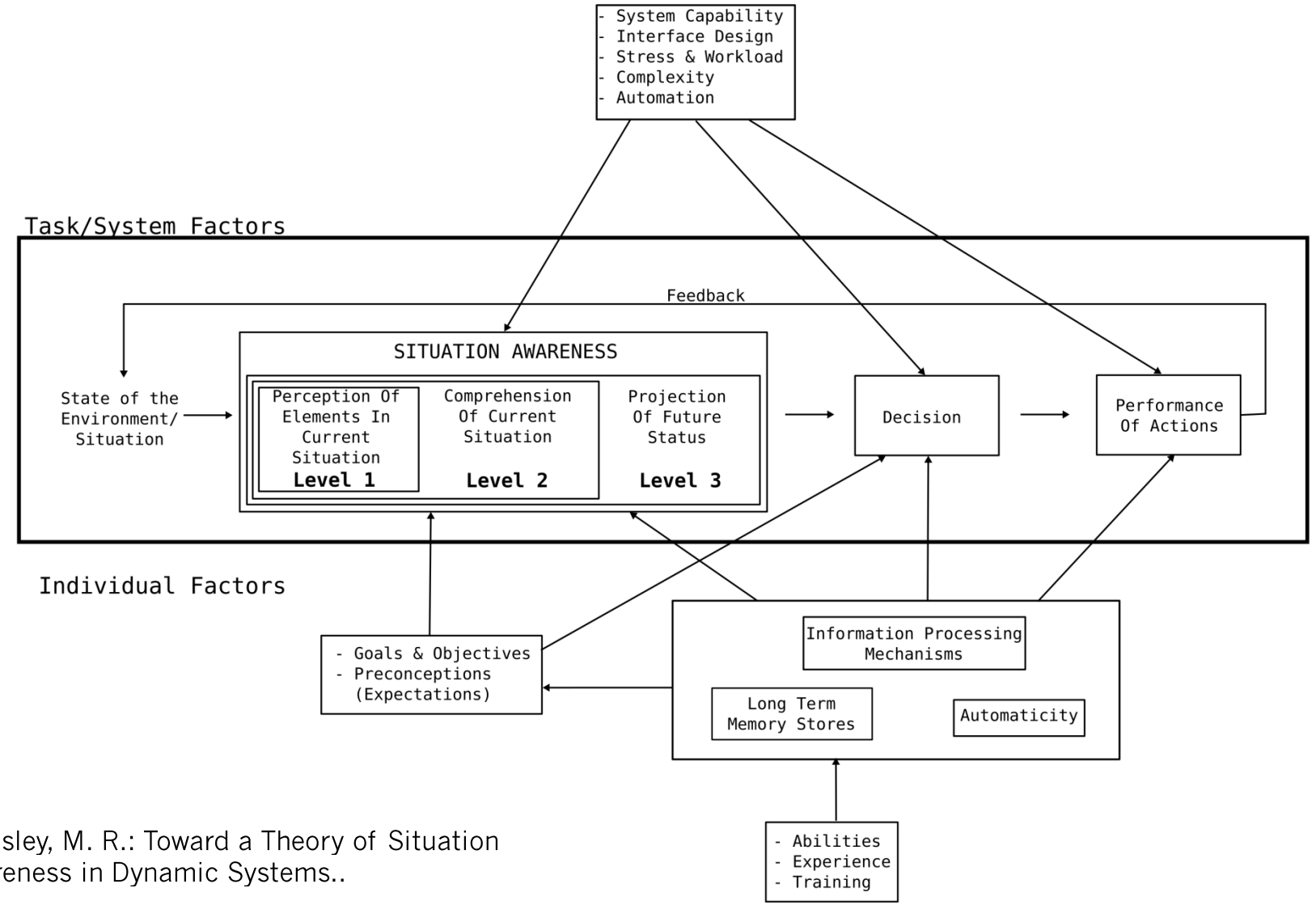
[1]Siponen, M. T..: A Conceptual Foundation for Organizational Information Security Awareness.
[2]Stevens, T.; Creasey, J. ; Kwok, A.; Maule, J.: Effective Security Awareness
[3]NIST 800-50: Building an Information Technology Security Awareness and Training Program

Situation Awareness

"Situation awareness is
the perception of the elements in the environment
within a volume of time and space,
the comprehension of their meaning,
and the projection of their status in the near future."[1]

[1]Endsley, M. R.: Toward a Theory of Situation Awareness in Dynamic Systems..

Situation Awareness



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An IT Security Sub-Situation

IT security awareness is
situation awareness (acc. Endsley)
limited to elements directly or indirectly
related to IT security.

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- **Level 1:** The first step in achieving SA is to perceive the status, attributes, and dynamics of relevant elements in the environment.
- **Level 2:** Based on the knowledge of Level 1 elements, particularly when put together to form patterns with other elements (gestalt), the decision maker forms a holistic picture of the environment, comprehending the significance of objects and events.
- **Level 3:** The ability to project the future actions of the elements in the environment [. . .] is achieved through knowledge of the status and dynamics of the elements and comprehension of the situation [. . .].

IT Security Related Elements

- Natural Elements
  - Your password.
  - The monthly password change notification.
  - Legitimate emails.
  - The “green lock” (valid certificate).
  - Files (trustworthiness)
    - Known file ending
    - Known source

- Everything that is aligned to given protection objectives.

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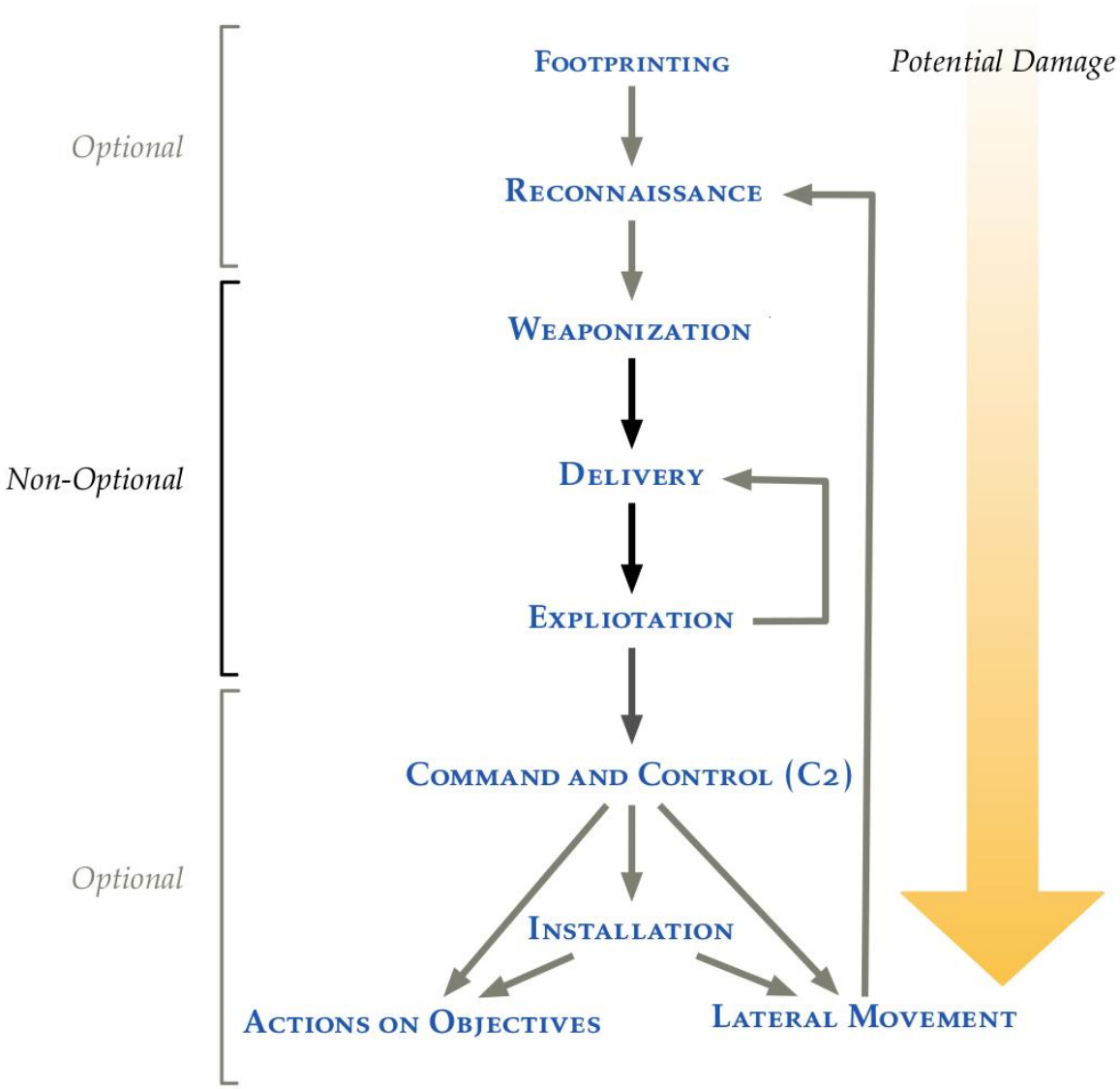
- Artifacts
  - The password request form that can’t be made to belong a specific authentication request.
  - The phishing mail (body, sender, link, attachment, ...)
  - Residual SQL syntax elements.
  - Constant resource utilization (fan noise / LED blink)

- Everything that is aligned to given protection objectives.
- Everything that is brought to the *situation artificially.*

Artifacts Originate from Attacks



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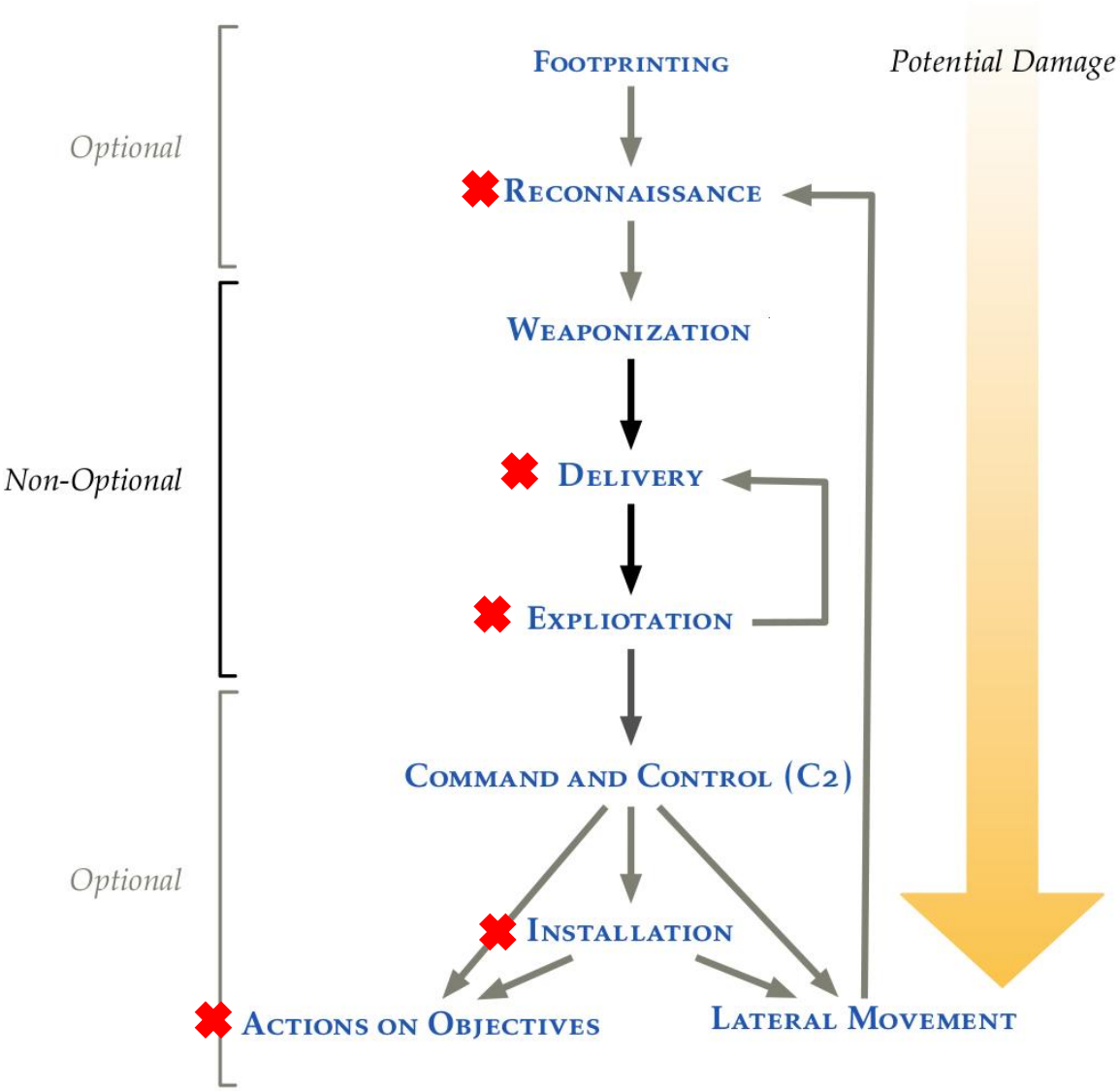
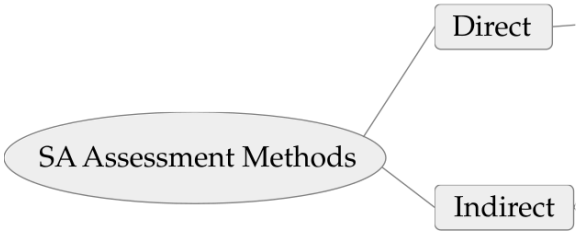


Measuring Situation Awareness

- Direct measurement:
  - Allows direct assessment of the item of interest.
  - Allows retrieval of SA about specific elements.

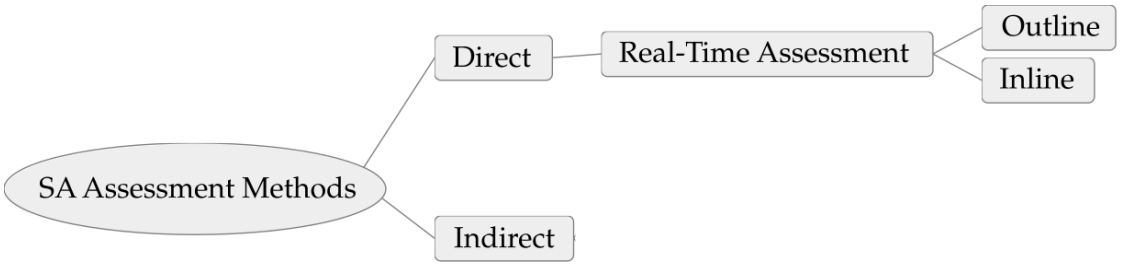
- Indirect measurement:
  - Does not measure the item of interest, but an effect that is assumed to be correlated.
  - May introduce bias and inaccuracies.



Direct Real-Time Assessment

- During a simulation (e.g. flight simulation) ...
  - ... the simulation in paused and the test operator asks questions about elements within the situation (outline).
  - ... the test operator pretends to be ground control and requests specific information of the individual (inline).

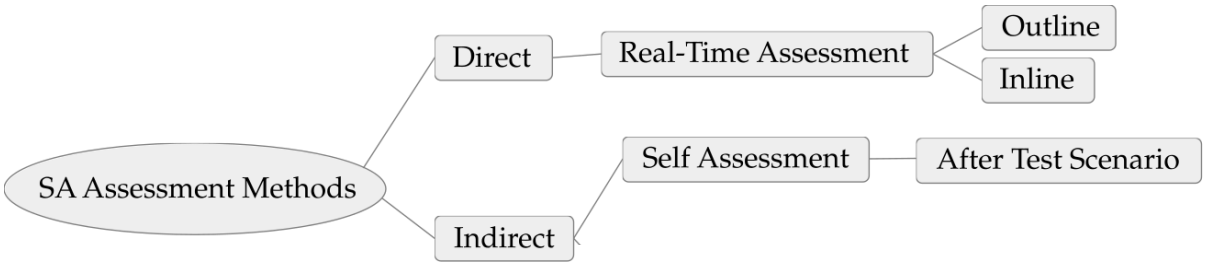
- Requirements:
  - High interaction
  - Control over the environment



Indirect Self Assessment

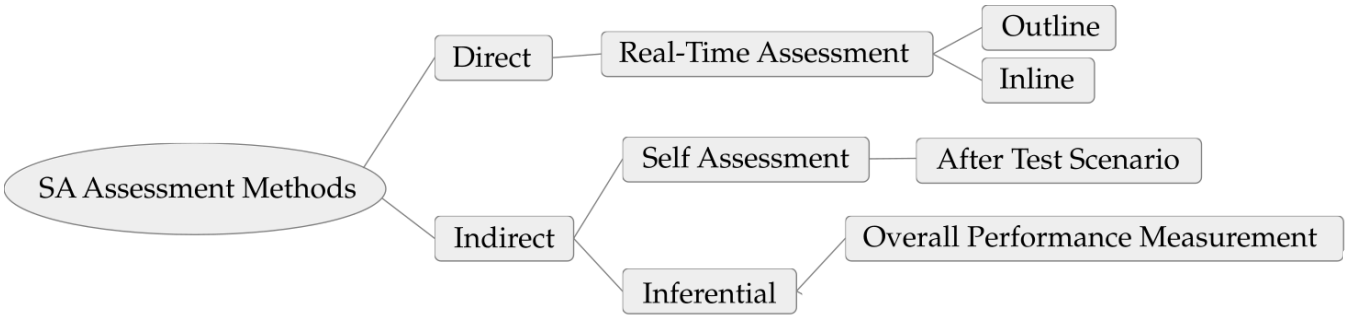
- After a situation the individual is interviewed / fills out a questionnaire
  - Questions about elements are criticized to test memory function rather then awareness.
  - Questions about the individuals own assessment of his/hers situation awareness rather test confidence then SA itself.

- Requirements:
  - High interaction
  - No control over the environment



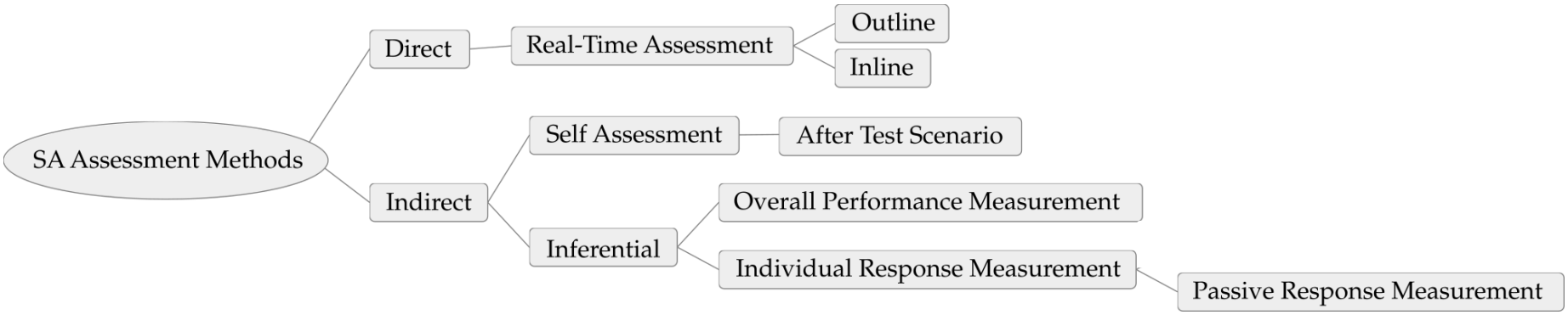
Overall Performance Measurement

- The hypothesis is, that better SA leads to better performance. Performance indicators are taken as measurement.
  - Performance indicators and results of direct SA assessment do not correlate.
  - There is to much bias.
  - Unknown effects for sub-situations.
- Requirements:
  - High interaction
  - No control over the environment



Passive Response Measurement

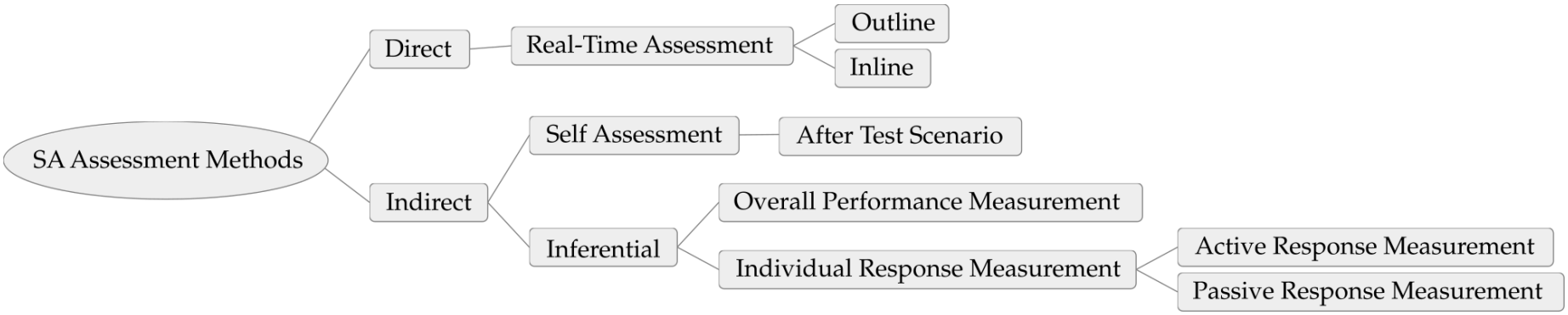
- The Individual shows psychophysical reaction to element exposure
  - This may include eye movement, brain activity, stress level reactions, ...
  - This shows weather or not an individual understands its situation (lvl1, lvl2)
- Requirements:
  - No interaction with the individual.
  - Limited control to the environment (monitoring).
  - Costly sensor equipment.



Active Response Measurement

- Experts anticipate and rate possible responses to an element
  - Which response shows *good* and *bad* SA.
  - Individuals actions are then rated against expert opinion.
  - Biased. *This is where further research has to be done.*

- Requirements:
  - No interaction with the individual.
  - Limited control to the environment (monitoring).
  - No costly equipment.



How IT Security Awareness Should be Tested

- Use the method that is applicable for your setting:
- Direct measurement method:
  - This can not be done during daily business.
- Active response measurement:
  - To much bias to be fully expressive.

- Recommendation (for now):
  - Rate a test by level (1,2,3).
    - Level 1: Is the element recognized?
    - Level 2: Can the individual distinguish between *natural element* and *artifact*?
    - Level 3: Can the individual anticipate possible consequences of his/her actions?
  - Take bias into account.

Thank You for your kind Attention

its.apt@uni-bonn.de