



The System Usability Scale (SUS) and its applicability to e-Learning environments

Shared Experience: Evaluating e-Learning usability based on SUS in TUCN

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Usability : important feature to assess eLearning/LMS quality

SUS System Usability Scale (SUS) Method

SUS applied for TUCN LMS Evaluation Iteration 1 &2



Quality Assessment in Tertiary Education

Association of Educational Assessment (AEA).

The EU framework of standards for educational assessment

<http://www.aea-europe.net/index.php/professional-development/standards-for-educational-assessment>

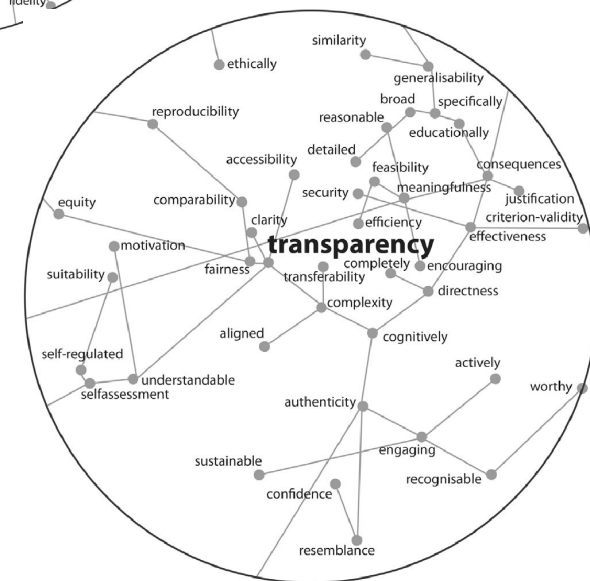
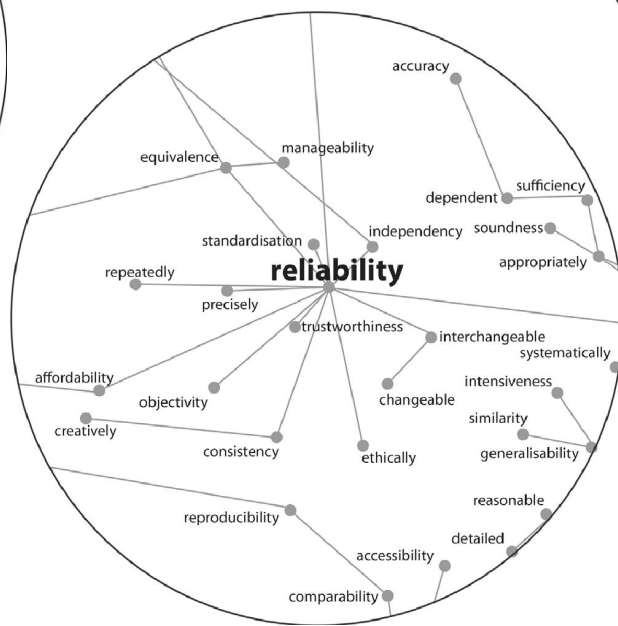
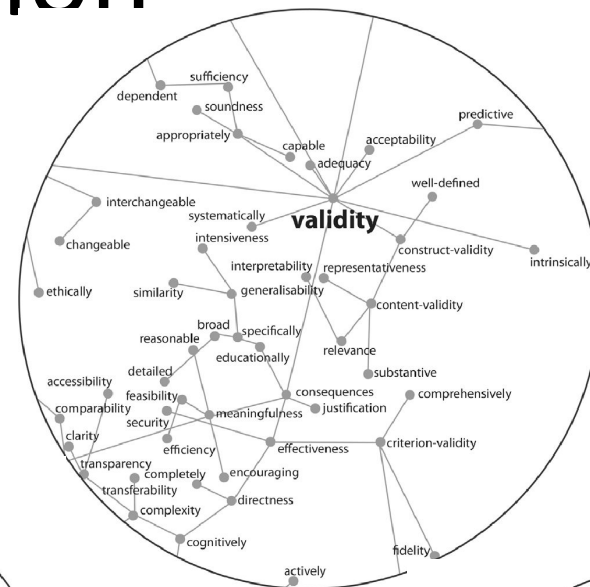
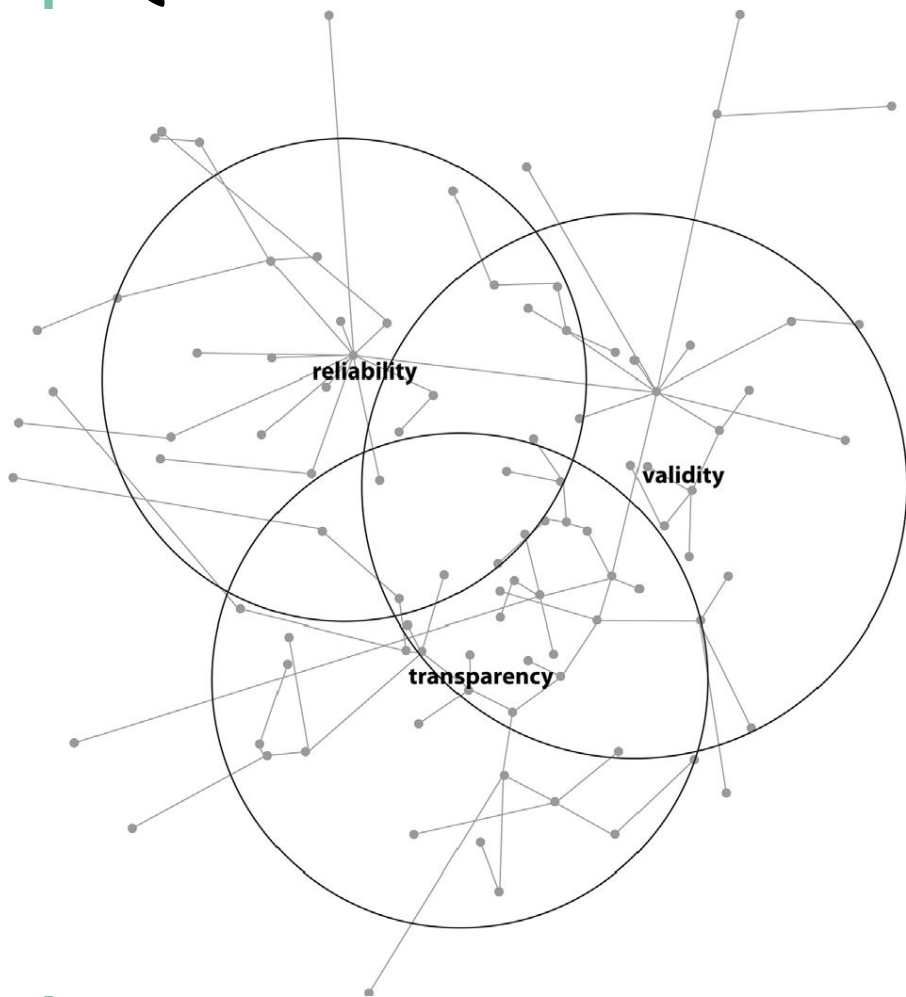
American Educational Research Association (AERA), American Educational Research Association, American Psychological Association (APA), & National Council on Measurement in Education (NCME).

Standards for educational and psychological testing

■ ■ ■



QA Criteria in Tertiary Education



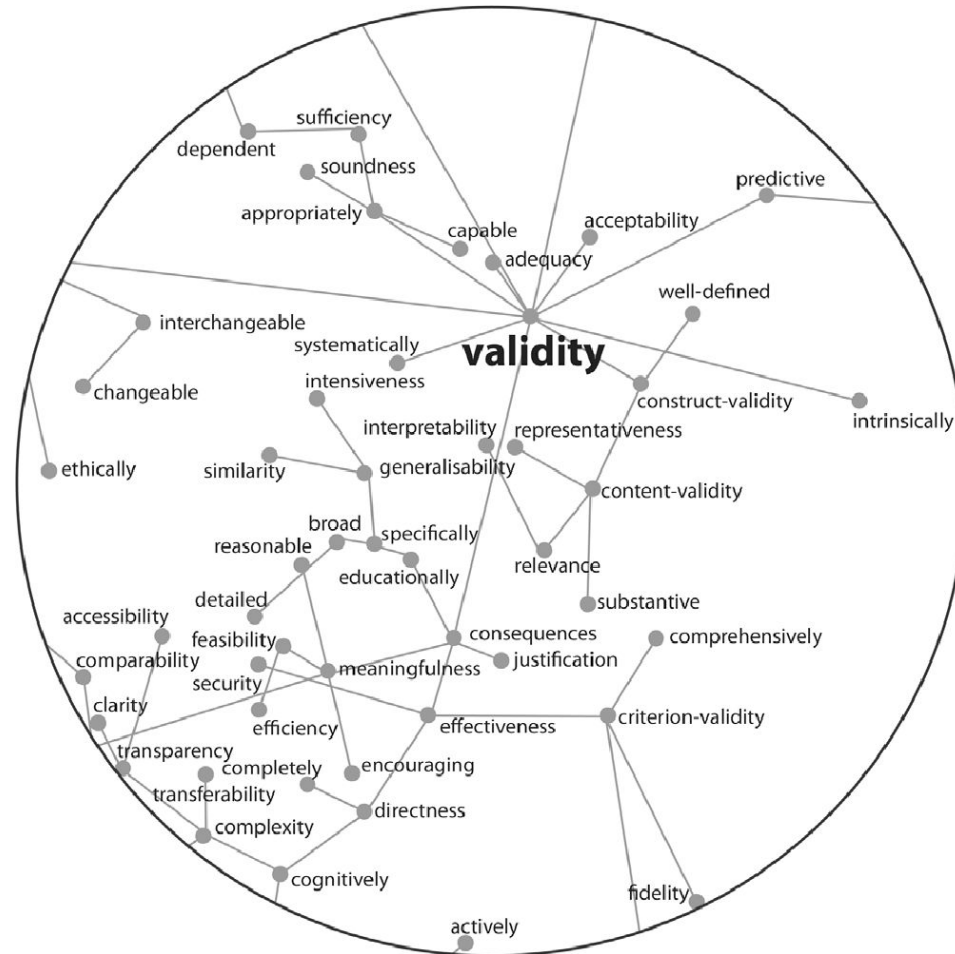
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Gerritsen-van Leeuwenkamp, K. J., Joosten-ten Brinke, D., & Kester, L. (2017). Assessment quality in tertiary education: An integrative literature review. *Studies in Educational Evaluation*, 55, 94-116.

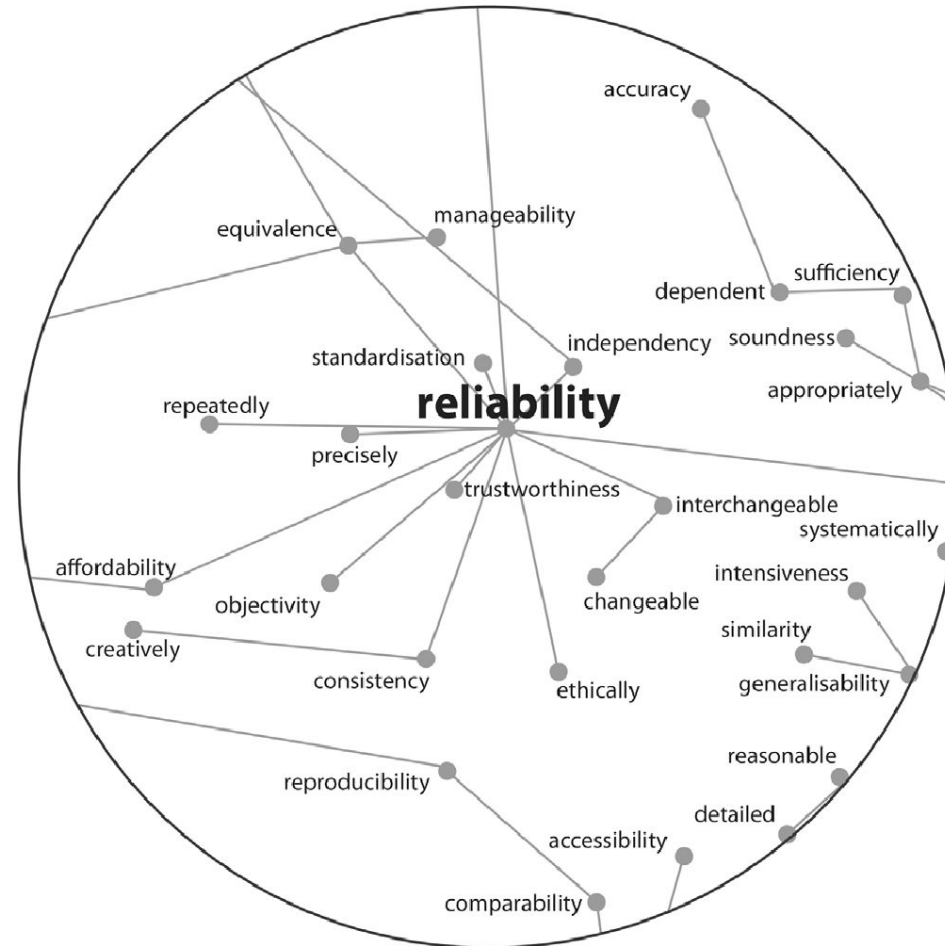
Validity in QA – tech metrics?



Validity: QA criteria applicable to evaluate the eLearning environment from a technological perspective



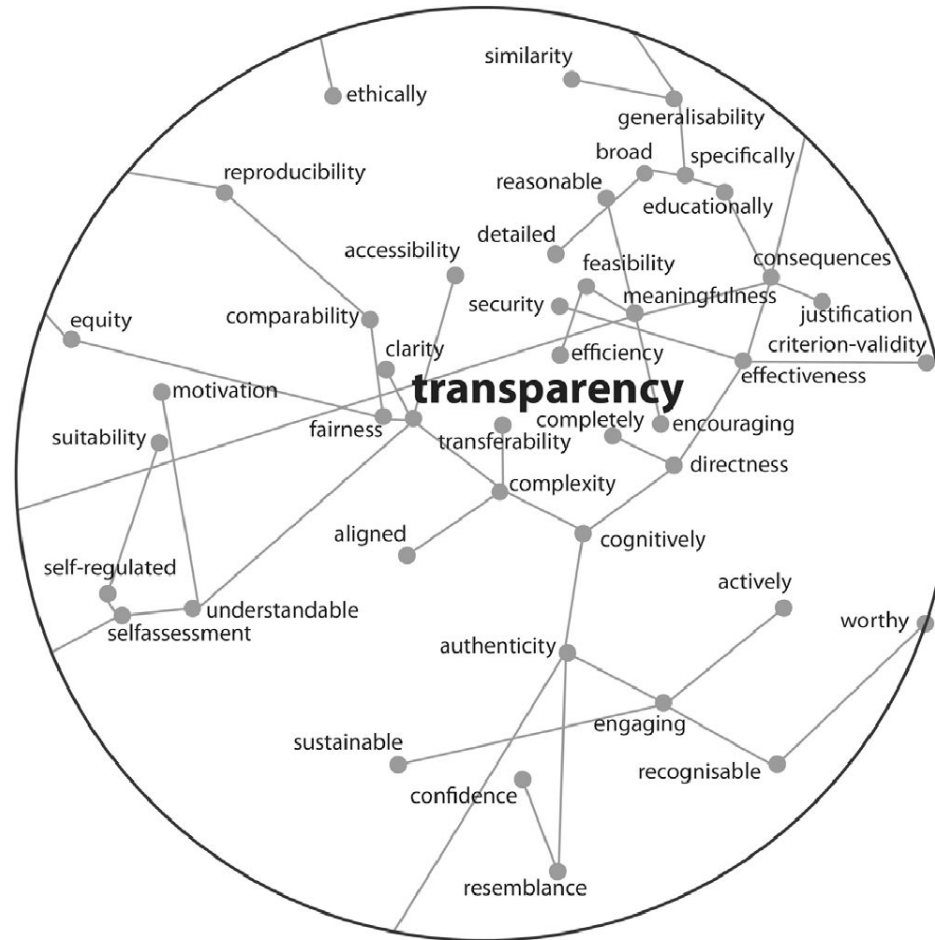
Reliability in QA – tech metrics?



Reliability: QA criteria applicable to evaluate the eLearning environment from a technological perspective



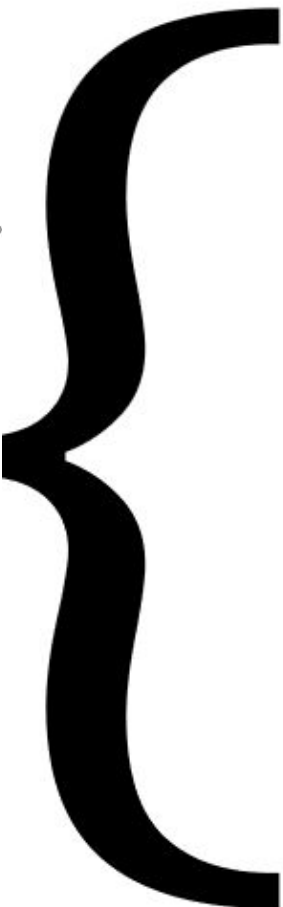
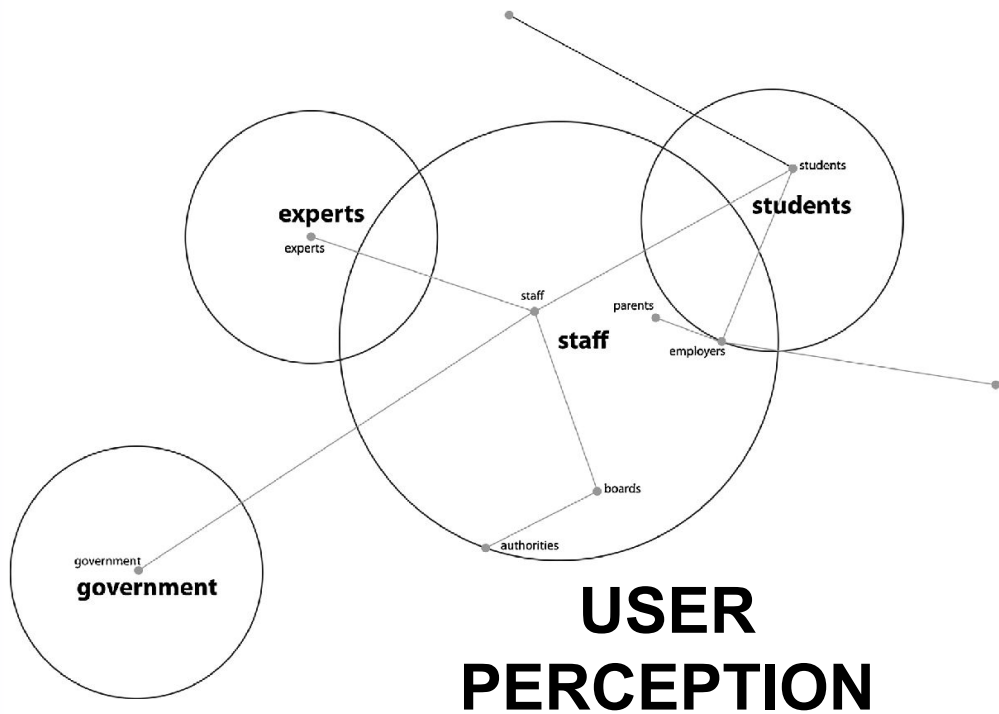
Transparency in QA – tech metrics?



Transparency: QA criteria applicable to evaluate the eLearning environment from a technological perspective



Quality criteria for LMS evaluation?



Usability to assess eLearning/LMS quality

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Usability as a property of software systems (I)

USABILITY?

“Making sure that something works well: that a person of average (or even below average) ability and experience can use the thing – for it’s intended purpose without getting hopelessly frustrated.”

Steve Krug, author of *Don't Make Me Think*

Contextualized by Nielsen :

“Concept that integrates various aspects of digital systems to characterize the quality of their design from the perspective of a user experience”

- Usability design methodology to contribute to quality and performance assessment
- Designed by software engineering theorists
- Field: software engineering practice
- Facilitates user-system interaction



Usability as a property of software systems (II)

Standards

DIN EN ISO 9241 – 11 Standard

“The extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use”

IEEE Standard 610.12-1990

“the ease with which a user can learn to operate, prepare inputs for, and interpret outputs of a system or component”



Usability applied to LMS

LMS: **complex software architectures:**

- ❑ **unique features:** content architecture, GUI, communication features, access security policies, access and retrieval, deployment
- ❑ 4 main communication objectives: **INFORM, EXHIBIT, INTERACT, PRODUCE**
- ❑ provides users with **effectiveness, efficiency & satisfaction** in performing tasks
- ❑ **Perceived usability** – most important factor for e-Learning Adoption

Why Usability Test?



Uncover Problems
in the design



Discover Opportunities
to improve the design

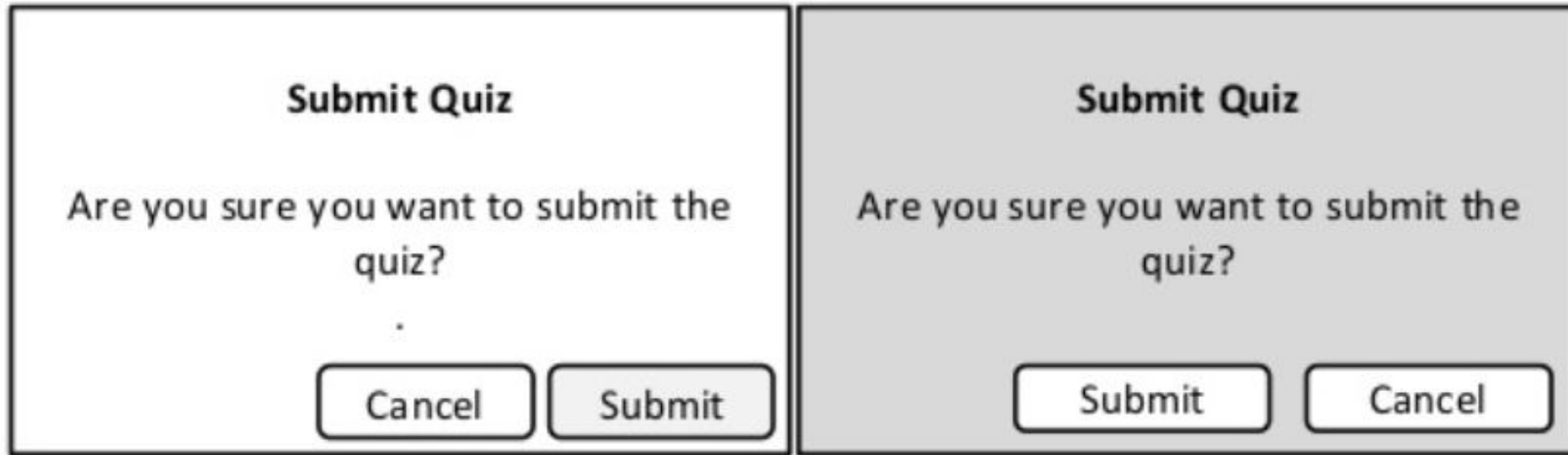


Learn About Users
behavior and preferences



Example of usability issue

Inconsistent navigation: people are usually on auto-pilot. They will click button on right without reading what it means.



Solution: design navigation that follow conventions and best practices , so users can focus on what matters: mastering subject



Usability attributes

Booth (1989)	usefulness, effectiveness, learnability, attitude
Brinck et al. (2002)	functionally correct, efficient to use, easy to learn, easy to remember, error tolerant, and subjectively pleasing
Clairmont et al. (1999)	successfully learn and use a product to achieve a goal
Dumas & Redish (1993)	perform tasks quickly and easily
Furtado et al. (2003)	ease of use and learning
Gluck (1997)	useableness, usefulness
Guillemette (1995)	effectively used by target users to perform tasks
Hix & Hartson (1993)	initial performance, long-term performance, learnability, retainability, advanced feature usage, first impression, and long-term user satisfaction
Kengeri et al. (1999)	effectiveness, likeability, learnability, usefulness
Kim (2002)	interface effectiveness
Nielsen (1993)	learnability, efficiency, memorability, errors, satisfaction
Oulanov & Pajarillo (2002)	affect, efficiency, control, helpfulness, adaptability
Shackel (1981)	ease of use, effectiveness
Shackel (1986, 1991)	effectiveness, learnability, flexibility, user attitude
ISO 9241 (2004)	effectiveness, efficiency, and satisfaction
ISO 9126 (1997)	learnability, operability, and comprehensibility



Usability attributes according to Nielsen

Learnability

How easy is it for users to accomplish basic tasks the first time they access the system, in a predefined timeframe?

Efficiency

Once users have assimilated the design, how quickly can they perform the tasks? (productivity - oriented)

Memorability

When users re-interact with the system after long time lapses, how easily can they reestablish proficiency?

Satisfaction

How many errors do users make, how severe are these errors, and how effective is the system supporting to correct such failures?

How pleasant is it to use the design? (user's subjective impression)



Usability attributes according to ISO 9241-11

ISO 9241-11 – Measuring usability



Effectiveness

- Can users achieve their goals with the product?
- Can they do what the product says it should be able to do?

Efficiency

How much effort is required from the users in order to achieve their goals?

Satisfaction

It is no good if users can achieve their goals quickly if they *hate the system*, they will probably go somewhere else

Effectiveness

replace:

- errors,
 - memorability
 - learnability
- in **Nielsen Model**



How can we evaluate Usability?

Usability Testing Methods

In-Person Usability Testing



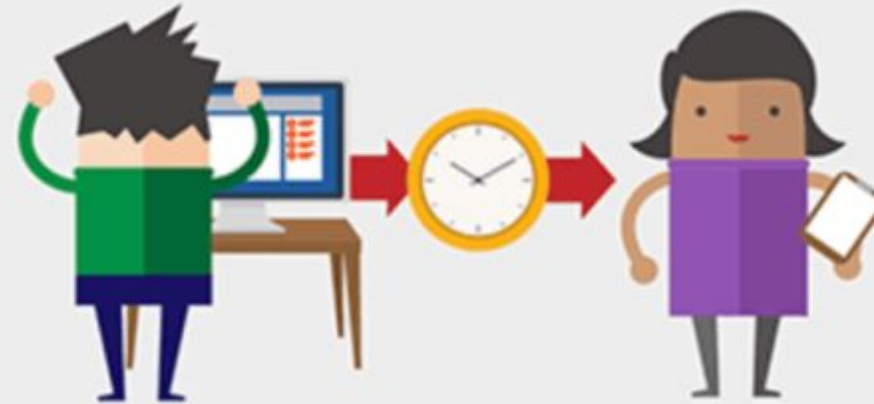
Tester is directly observed and interacted with during the testing session

Monitored Remote Usability Testing



Tester completes actions remotely but is observed or engaged remotely

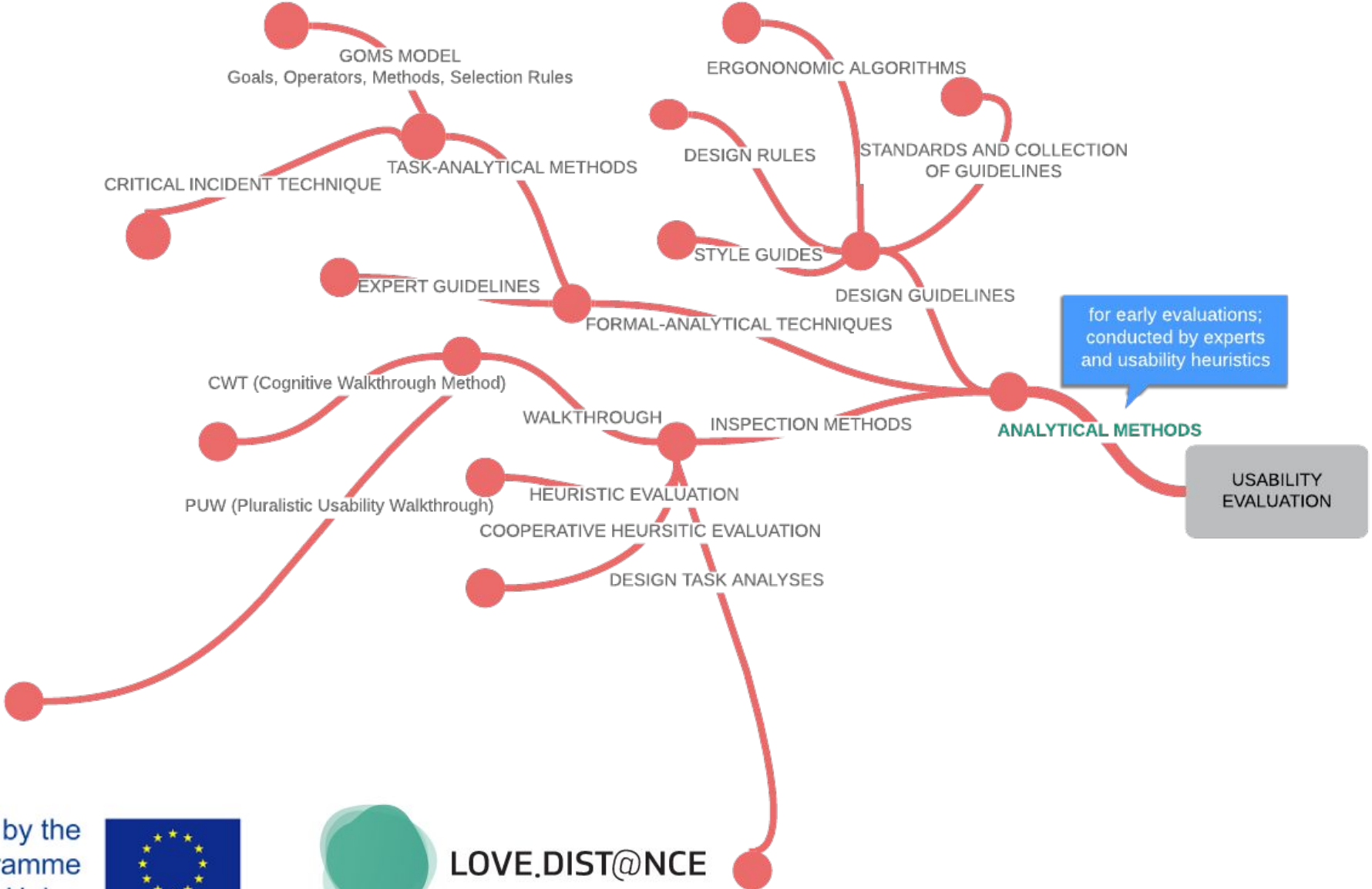
Unmonitored Remote Usability Testing



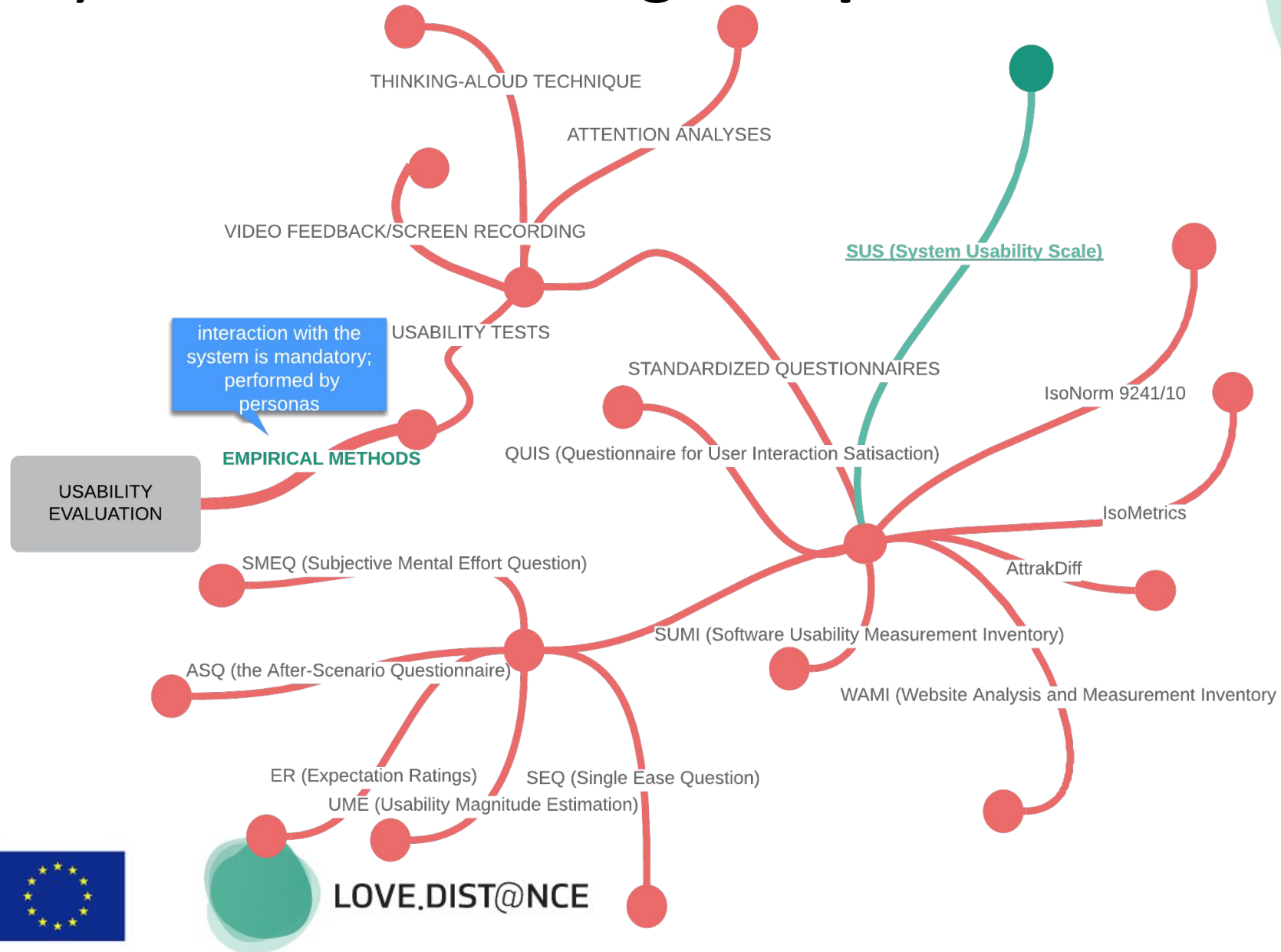
Tester completes actions and results are reviewed at a later time



LMS Usability Evaluation through Analytical Methods



LMS Usability Evaluation through Empirical Methods



SUS System Usability Scale (SUS) Method

- ❑ reliable tool for subjective measuring the perceived usability
- ❑ 10 item questionnaire ranked with a Likert Scale:

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
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- ❑ applicability to a wide variety of products and services, hardware, software, mobile devices, websites and applications.



SUS – Method: Questionnaire

When a SUS is used, **participants are asked to score the following 10 items** with one of five responses that range from **Strongly Agree to Strongly disagree**:

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.



SUS – Method: **Analysing results**

Interpreting Scores

- The participant's scores for each question are converted to a number, added together
- then multiplied by 2.5 to convert the original scores of 0-40 to 0-100.
- The resulting scores (0-100) are not %, should be considered only in terms of their percentile ranking

NOTE. Scoring interpretation can be complex and subjective

- a SUS score above 68 would be considered above average and anything below 68 is below average, however the best way to interpret your results involves “normalizing” the scores to produce a percentile ranking.



SUS – Method: Scoring

	Strongly disagree				Strongly agree	
1. I think that I would like to use this system frequently	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	4
2. I found the system unnecessarily complex	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1
3. I thought the system was easy to use	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1
4. I think that I would need the support of a technical person to be able to use this system	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4
5. I found the various functions in this system were well integrated	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1
6. I thought there was too much inconsistency in this system	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2
7. I would imagine that most people would learn to use this system very quickly	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	1
8. I found the system very cumbersome to use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	1
9. I felt very confident using the system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	4
10. I needed to learn a lot of things before I could get going with this system	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3

Total = 22

SUS Score = 22 * 2.5 = 55

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
0	1	2	3	4	question
4	3	2	1	0	reverse question

Total score : maximul 40

Total SUS Score : Total score*2.5= maximum 100



SUS – Method: Advantages & Limitations

Advantages of using SUS:

- Objectivity, replicability, quantification, economy, communication, generalization
- Robust even for small sample sizes
- Proven validity – it can effectively differentiate between usable and unusable systems

Limitations of SUS:

- The scoring system is somewhat complex
- SUS is not diagnostic - its use is in classifying the ease of use of the site, application or environment being tested
- Might not be sufficient, should be augmented by analytics



SUS applied for TUCN LMS Evaluation

Study Cases

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