

Experiences in Risk Management

From Identification to Mitigation

Excerpt from a Test Plan template

Why a matrix?

In this chapter, the Test Risk Matrix is presented, the result of the Test Risk Analysis, by outlining the test strategy: based on several analyses

*Where are the risks from a technological point of view?
Where are the risks from a business point of view?*

Several types? Several iterations? ...?

Are they (all) relevant?

Note 1: Rating 1-5: 1 = no, not at all 5 = yes, very much

Note 2: Take care that, as far as possible, there is an even distribution (over functions) of 1-5 in each column

Risk Factors	Risk Factors													Total probability	Damage / Impact	Usage frequency	Commercial Importance	Total Impact
	Multi site development	Integration of more than two products	Complex function	New function	New tools used	Inexperienced developer	Many (new) 3rd party components used ?	Multiple developers	High time pressure	Highly optimised	Many bugs in past	Many interfaces						
Functionality																		
Marketing Req.														0				0
														0				0
														0				0
Service Req.																		0
																		0
																		0
Application Req.																		0
														0				0
														0				0
Other Risks																		0
																		0
																		0

Too many questions

Are they (all) known?



André VERSCHELLING
Sr. Test Consultant

Profile

Sr. Test Consultant and Trainer at AL TEN and board member of the BNTQB. Helping clients to setup their test strategies and processes, especially in R&D environments

Contact



andre.verschelling@alten.nl
andre.verschelling@bntqb.org

Skills

- ★★★★★
- ★★★★★☆
- ★★★★★☆

Projects

- 2022 -** Test Automation Architect at ASML
V&V lead at Alstom
- 2019 - 2022** Functional Cluster Test Architect at ASML
- 2016 - 2018** Platform Test Architect at Philips
- 2015 - 2016** Test Architect at Vanderlande
Test Consultant at Lely
Test Coach at Ultimaker

Career

- 2018 -** Board member
- 2015 -** Sr. Test Consultant
- 2006 - 2014** Test Consultant
- 1996 - 2005** Accredited IT specialist
- 1991 - 1995** SW Developer and Test Engineer

Education

-

Hobbies



Risk is the possibility of
a negative or
undesirable outcome or
event
ISTQB® CTAL-TM 2012







RISK IDENTIFICATION

The process of finding, recognizing and recording risks

- Initial notice of a risk
- Expect the unexpected



RISK ANALYSIS

The process to comprehend the nature of risk and to determine the level of risk

- Assessment of the risk
- Rate its importance

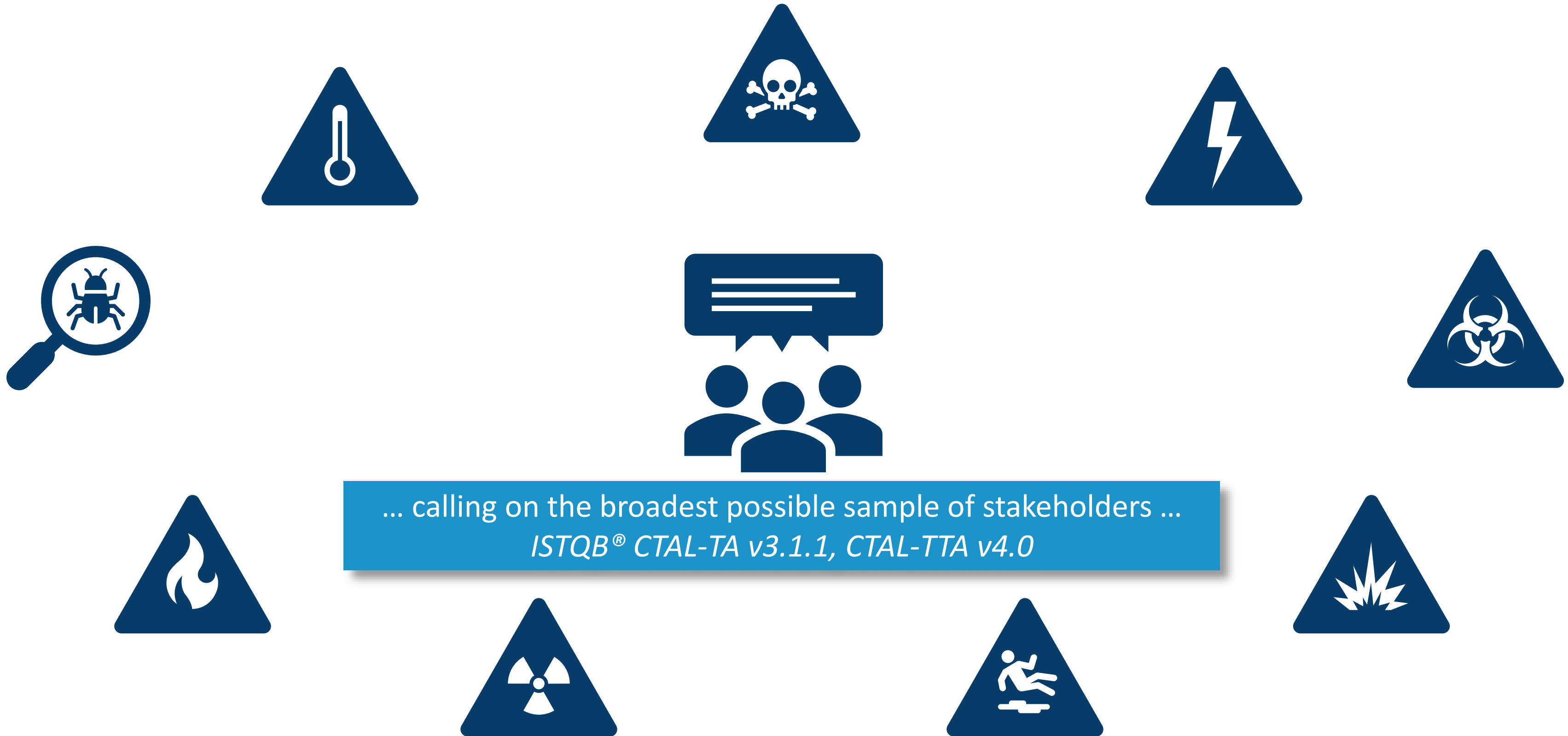


RISK EVALUATION OR CONTROL

Determine the significance of the risk and make decisions about risk treatment actions

- Dealing with the risk
- Ignore, Transfer, Mitigate or create Contingency Plan





... calling on the broadest possible sample of stakeholders ...
ISTQB® CTAL-TA v3.1.1, CTAL-TTA v4.0

What happens in real life

Identifying test items based on requirements

Identifying requirements

	Risk Factors	Multi site development	Integration of more than two products	C fu
Functionality				
Marketing Req.				
Service Req.				
Application Req.				
Other Risks				

Test item	Explanation
Therapy Station	All hardware and software used by the PodOne in the OP a. All-in-one PC b. Therapy software c. All other hardware co equipment carrier
Physics Station	All hardware and software us a. PC / Laptop / termina b. Physics Software
Planning Station	All hardware and software lo a. PC / Laptop / termina b. Planning Software
Equipment Carrier	The hardware of the cart / equ
EM Tracking	The Electro Magnetic Trackin a. NDI - SCU b. Interfaces (TCU) i. Instrument co ii. Seed detectio c. Field Generator d. Reference sensor e. Software Module for i introduced) i. USB / RS232 ii. Protocol iii. Software reas iv. Seed detectio
Network Topology	The network setup comprising a. Ethernet switch + cab b. Logical topology (con c. Connectivity: US / RS OIS / Active directory
Power Supply	The (certified) power supply fr supply installed on the equipn a. All-in-one PC b. NDI equipment (a/o th
Cable Set	The set of cables for needles.
3D Ultra Sound integration	The integration with the CX50

- Behaviour**
The different states defined in CSW745 are accepted as-is. The correctness of the states is assumed while testing the specific behaviours such as measurement or stimulation.
- Shutdown**
Compliance with CSW773, graceful shutdown, is to be verified.
- Activity Monitoring**
For activity monitoring, requirements CSW743, CSW746 & CSW747 are to be verified. For Fumo3 this verification is limited to the verification whether activity is noticed and logged using the data logging functionality. The correctness of the monitoring in relation to the actual form of activity is outside the scope of Fumo3.
- Electrode Switching System**
The feature to be tested is described in CSW689 & CSW691. Most attention will be paid to CSW689 by verifying whether the High Voltage Switch is populated with the correct data on the SPI interface.
- Measurement**
The items to be tested are defined by the requirements underneath CSW561. For measurement, the compliance with requirements on the impedance measurement of the skin will be verified both in terms of applicable measurement range and applicable tolerances.
- Stimulation**
All requirements underneath CSW611 are part of the features to be tested.
- Fault Detection**
The only feature to be tested is CSW775, the check on whether or not the electrodes are properly connected.
- General**
The only feature to be tested is CSW798, the ability to retrieve the software version.
- Data Logging**
For data logging, the features to be tested are CSW749, CSW750, CSW755, CSW752, CSW753, CSW756, CSW766 & CSW789. With respect to this item, the content of the logging will be tested but the format of the logging is accepted as-is

These are not risks, but things that might have risks

What happens in real life

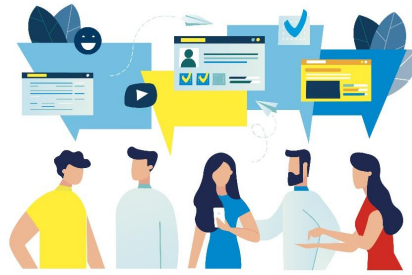
Elaborated using FMEA like approaches

Risk ID	Requirement ID	Risk definition		
		Cause	Effect(s)	Consequence(s)
TE-01		Different code for NXT and NXE	Different test coverage	Bug caught in NXT could exist in NXE
TE-02		Different correction potential & CET software of EUV machine vs DUV machine	Same wafer align fingerprint will give different actuation compared to DUV	Overlay impacted
TE-03		Slight differences in point of time when wafer align is called to model or to give their fingerprint		In extreme cases maybe throughput impact?
TE-04		Different sequence behavior EUV machine vs DUV machine (Sequencer software is different)		
TE-05		Generation of IDAT/ADEL is different between EUV/DUV. (I thought you depend on a CET IDAT/ADEL for offline tools)	Offline tool	

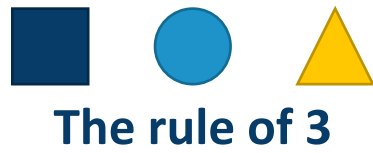
Title (Max 50 signs)	Cause	Risk/Issue	Effect
Late integration with LIS	Late delivery of LIS	Delay in delivery	Late delivery to customer
CS/DE support, phased diagnostics	C: Not all existing diagnostics available for initial packages	R: Higher level of expertise needed for trouble shooting	E: Higher support effort for CS, More need for D&E support
Mistakes during strategy import	Many different ADELS have to be connected manually	User will make mistakes using the product	None optimal product performance
iACT Diagnostics delay	Diagnostics to partially implemented in a new technology	Unforeseen changes in functionality or software development difficulties	Delay in delivery of diagnostics

Underlying technique unknown to most users

Title	Effect	Cause(s)	Controls
Water is rejected before FIWA	ADEL and SECS reporting different defaults than in Legacy behavior	No Fiwa data reported	
ADLaME verif/valid checks for legacy	Some legacy checks are forgotten and are not implemented in SBM --> regression	Too complex logic for ADELAME verification and validation cheks	What in legacy was not blocked at lot verification/validation is now blocked in SBM (and viceversa) --> cannot queue lots
ADLaME verif/valid checks for legacy	Some legacy checks are forgotten and are not implemented in SBM --> regression	Too complex logic for ADELAME verification and validation cheks	What in legacy was not blocked at lot verification/validation is now blocked in SBM (and viceversa) --> cannot queue lots
ADLaME verif/valid checks for legacy	Some legacy checks are forgotten and are not implemented in SBM --> regression	Too complex logic for ADELAME verification and validation cheks	What in legacy was not blocked at lot verification/validation is now blocked in SBM (and viceversa) --> cannot queue lots



1. Three concepts
2. Three words
3. Three techniques



Effect

- Consize description of what could go wrong and its impact

Cause

- Description of what leads to the effect

Control

- What is, or can be done, to prevent the risk from occurring



1. Three concepts
2. Three words
3. Three techniques



The rule of 3

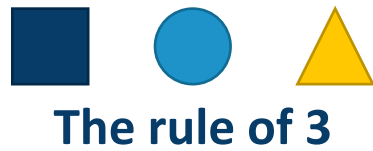
GIVEN – WHEN – THEN

GIVEN the system / application is ...
WHEN a certain cause is triggered
THEN the effect is

GIVEN a certain cause is triggered
WHEN control is taken
THEN the effect does not materialize



1. Three concepts
2. Three words
3. Three techniques



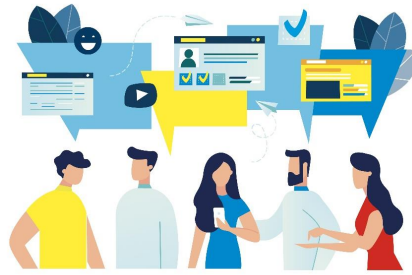
Use techniques that fit you / your project

For example, State Transition Testing, Control Flow Testing and Data Combination Testing

GIVEN the system is in state X
WHEN unwanted event is fired
THEN the effect is

GIVEN the application is at flow diversion point A
WHEN path # is taken
THEN the effect is

GIVEN the software is running
WHEN data [M, N, O, P] is combined
THEN the effect is



The rule of 3

1. Three concepts

1. Effect

2. Cause

3. Control

2. Three words

1. Given

2. When

3. Then

3. Three techniques

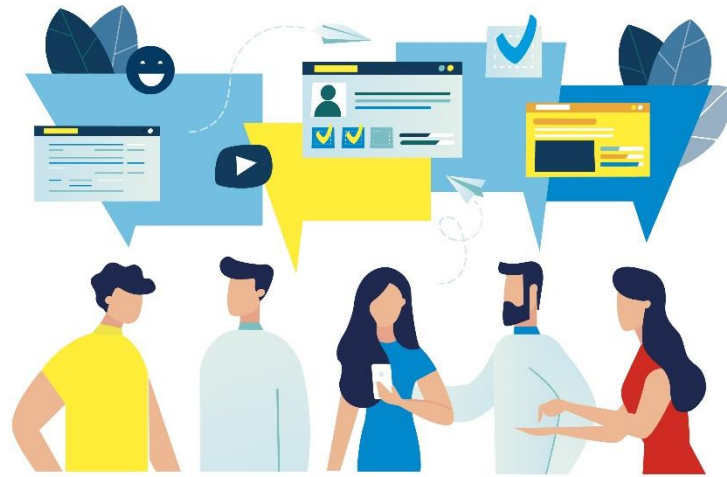
1. STT

2. CFT

3. DCT



Make your own choice!



RISK IDENTIFICATION

The process of finding, recognizing and recording risks

- Initial notice of a risk
- Expect the unexpected



RISK ANALYSIS

The process to comprehend the nature of risk and to determine the level of risk

- Assessment of the risk
- Rate its importance



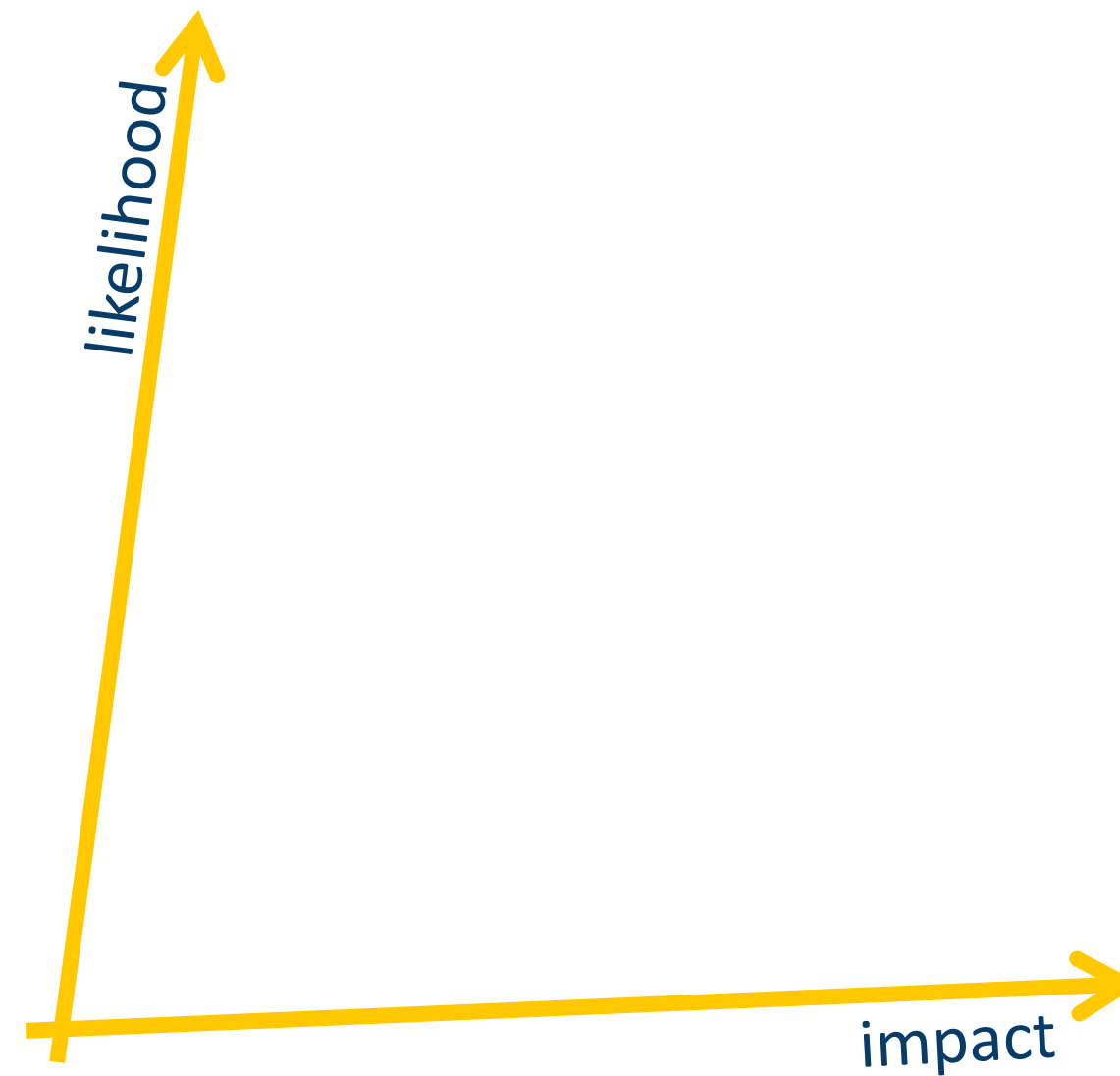
RISK EVALUATION OR CONTROL

Determine the significance of the risk and make decisions about risk treatment actions

- Dealing with the risk
- Ignore, Transfer, Mitigate or create Contingency Plan



Risk assessment is the study of the identified risks, specifically, categorizing each risk and determining its risk level – *ISTQB® CTAL-TA v3.1.1*



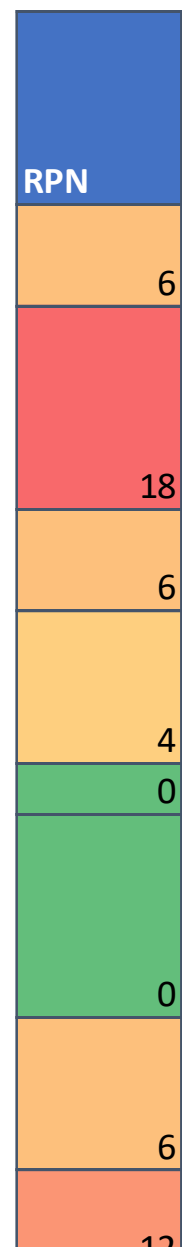
What happens in real life

Note 1: Rating 1-5: 1 = no, not at all 5 = yes, very much

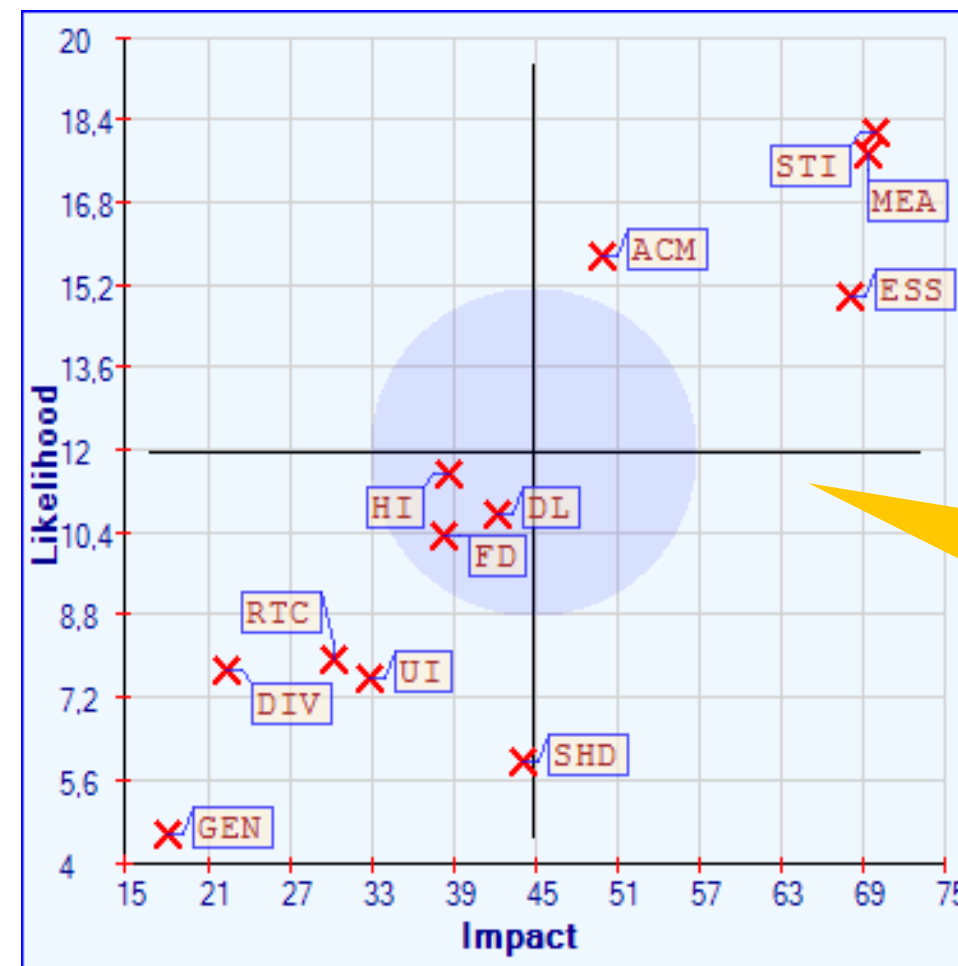
Note 2: Take care that, as far as possible, there is an even distribution (over functions) of 1-5 in each column

Risk Factors	Risk Factors														Total probability	Damage / Impact	Usage / frequency
	Multi site development	Integration of more than two products	Complex function	New function	New tools used	Inexperienced developer	Many (new) 3rd party components used ?	Multiple developers	High time pressure	Highly optimised	Many bugs in past	Many interfaces					
Functionality																	
Marketing Req.															0		
															0		

Far too many factors being assessed



Risk Priority Numbers determined without clear meaning of the numbers



Matrices created with more questions than clarity

What happens in real life

Standards and policies do not always help

			Risk Matrix				
			Probability				
			Remote	Unlikely	Possible	Likely	Certain
Severity			1	2	3	4	5
Fatal injuries, death	Catastrophic	5	5	10	15	20	25
Extensive injuries	High	4	4	8	12	16	20
Medical assistance required	Medium	3	3	6	9	12	15
First aid procedures	Low	2	2	4	6	8	10
Small bruises, cuts	Negligible	1	1	2	3	4	5

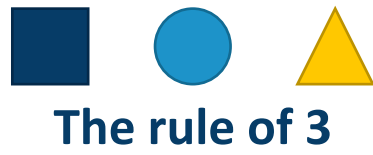
Should orange be treated different than yellow?

4 can be in two categories?

8 is higher risk than 9?

Assessment of the risk with the rule of three

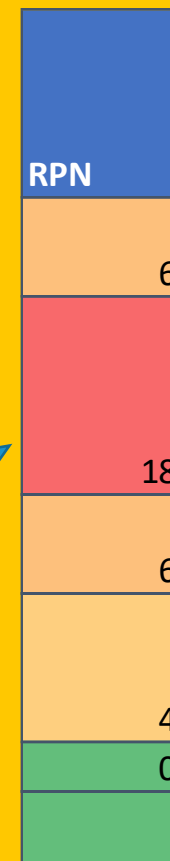
1. Three words
2. Three levels
3. Three techniques



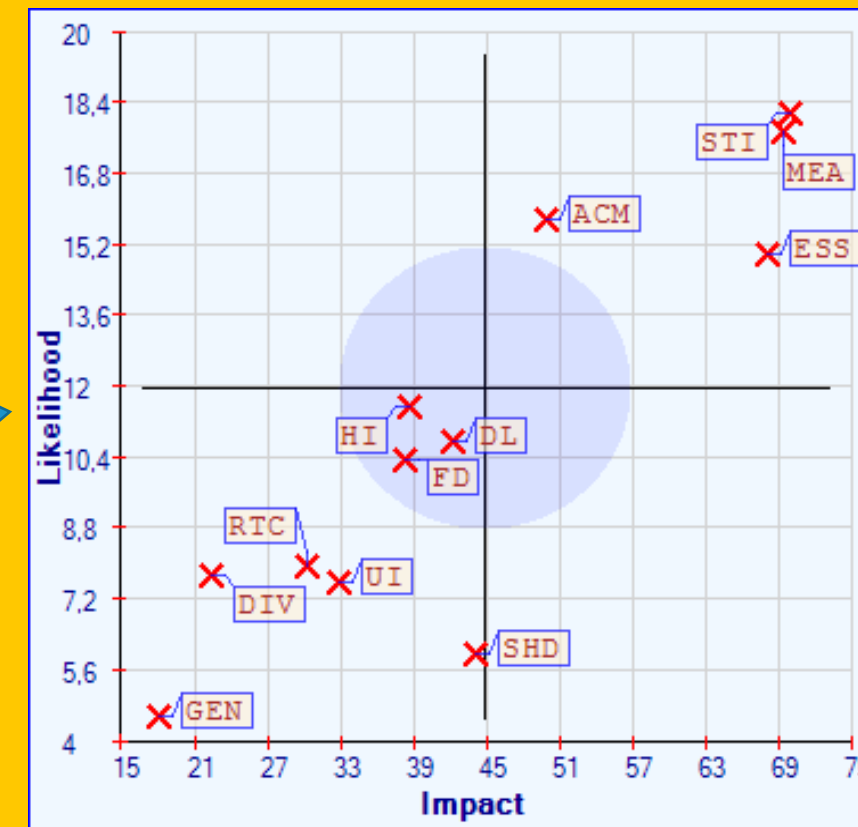
Good, is & enough

→ Good is good enough

Is, e.g., 21 really different than 18

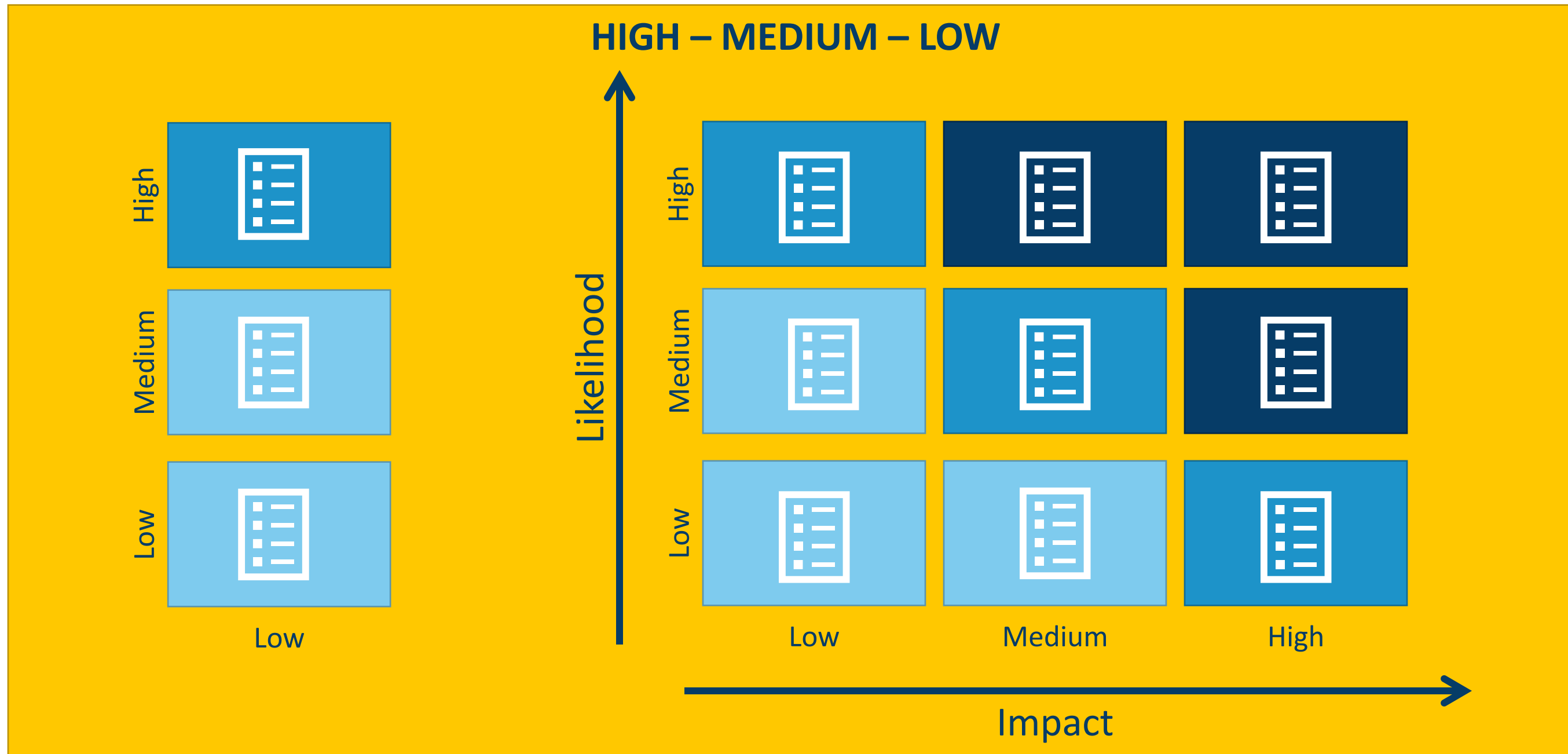
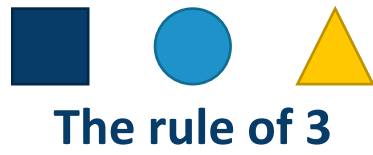


How significant are the numbers?



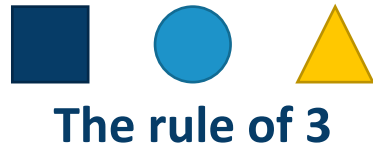


1. Three words
2. Three levels
3. Three techniques

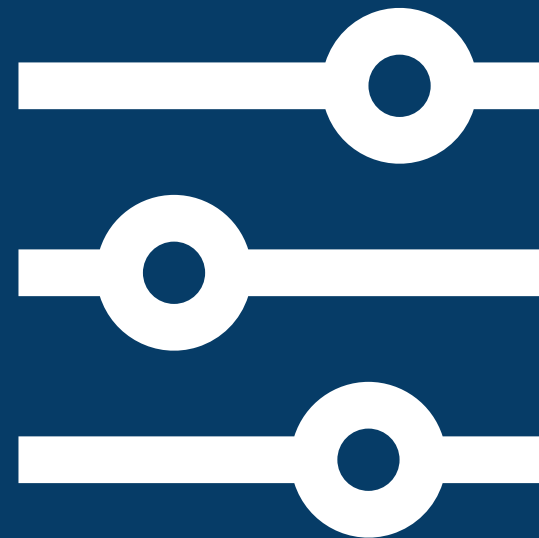
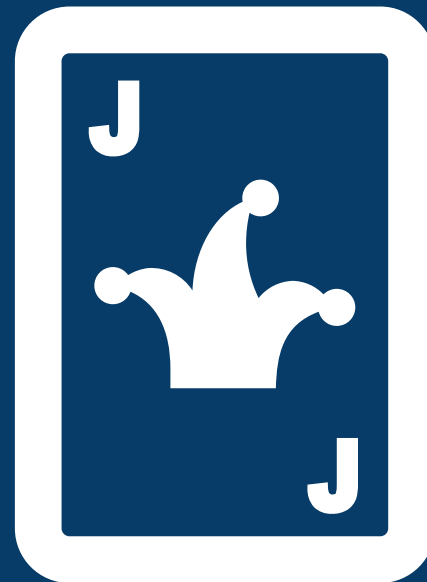




1. Three words
2. Three levels
3. Three techniques



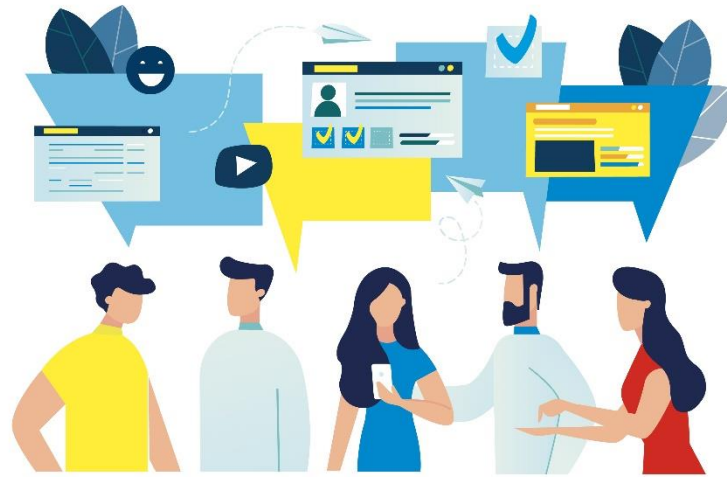
Risk Poker, Impact & Likelihood Assessment and Lean Risk Wall of Fame





The rule of 3

1. Three words
 - Good is (good) enough
2. Three levels
 1. High
 2. Medium
 3. Low
3. Three techniques
 1. Risk Poker
 2. Likelihood and Impact Assessment
 3. Lean Risk Wall of Fame



RISK IDENTIFICATION

The process of finding, recognizing and recording risks

- Initial notice of a risk
- Expect the unexpected



RISK ANALYSIS

The process to comprehend the nature of risk and to determine the level of risk

- Assessment of the risk
- Rate its importance

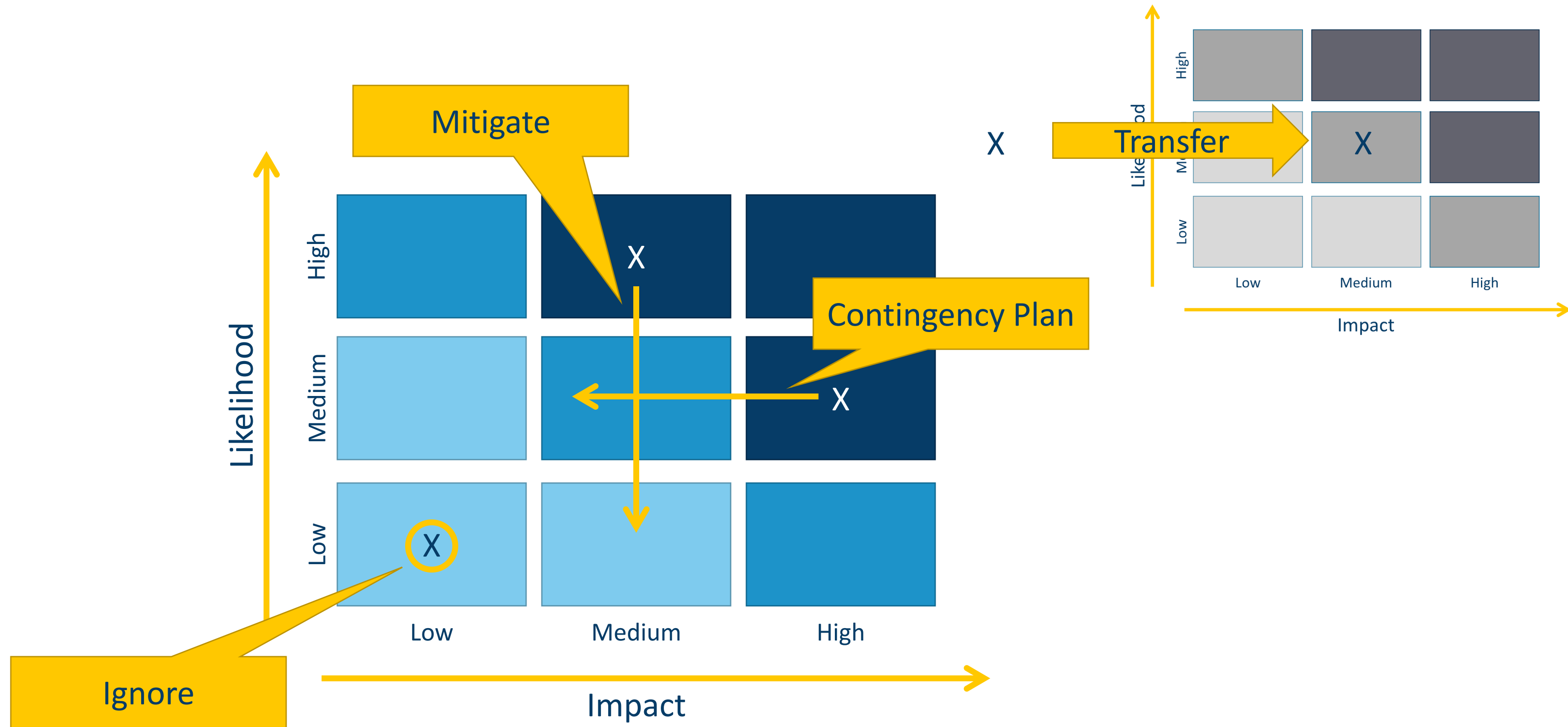


RISK EVALUATION OR CONTROL

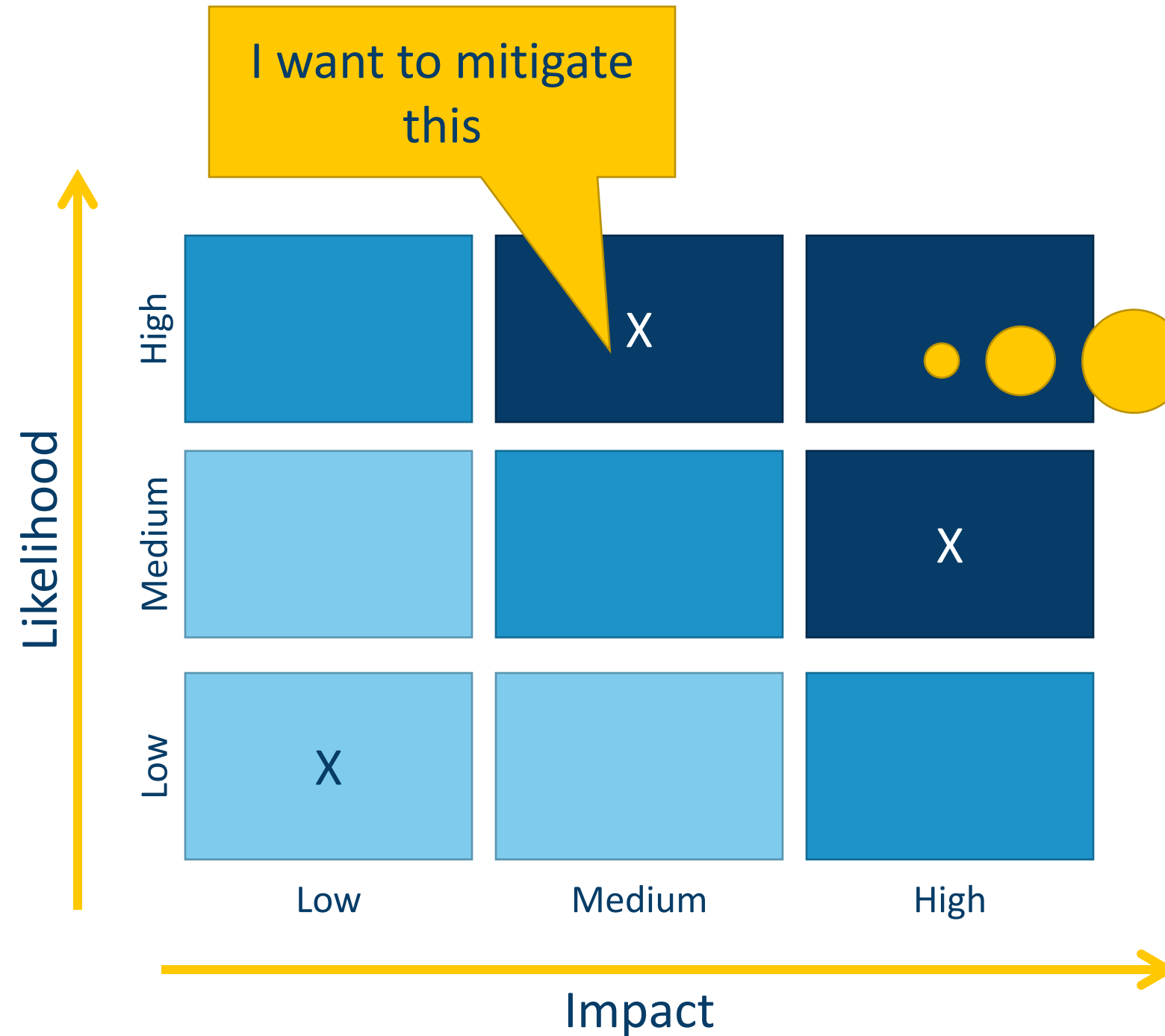
Determine the significance of the risk and make decisions about risk treatment actions

- Dealing with the risk
- Ignore, Transfer, Mitigate or create Contingency Plan



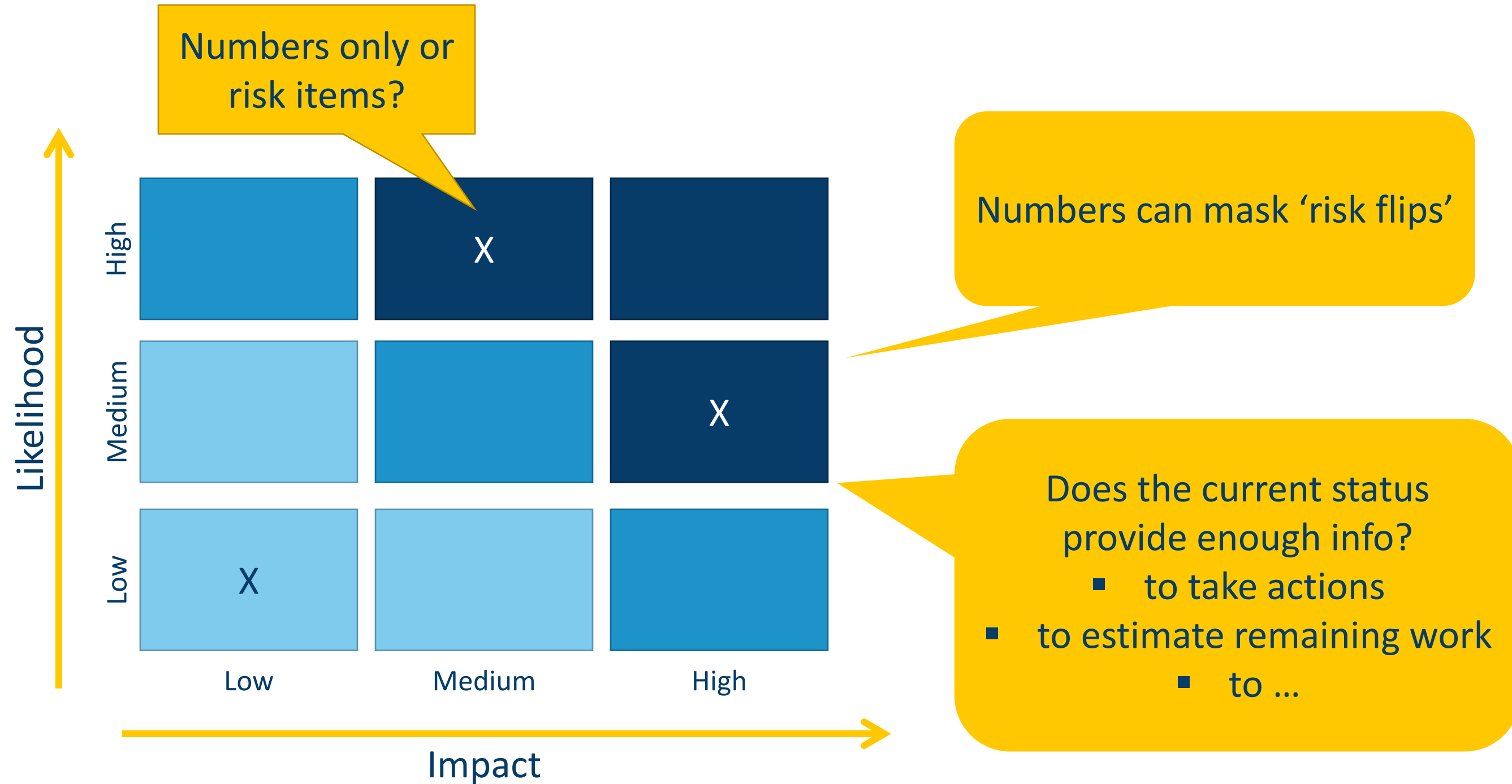


What happens in real life



Which steps to take?
Which test technique to use?
Where to test?
When to test?
...?

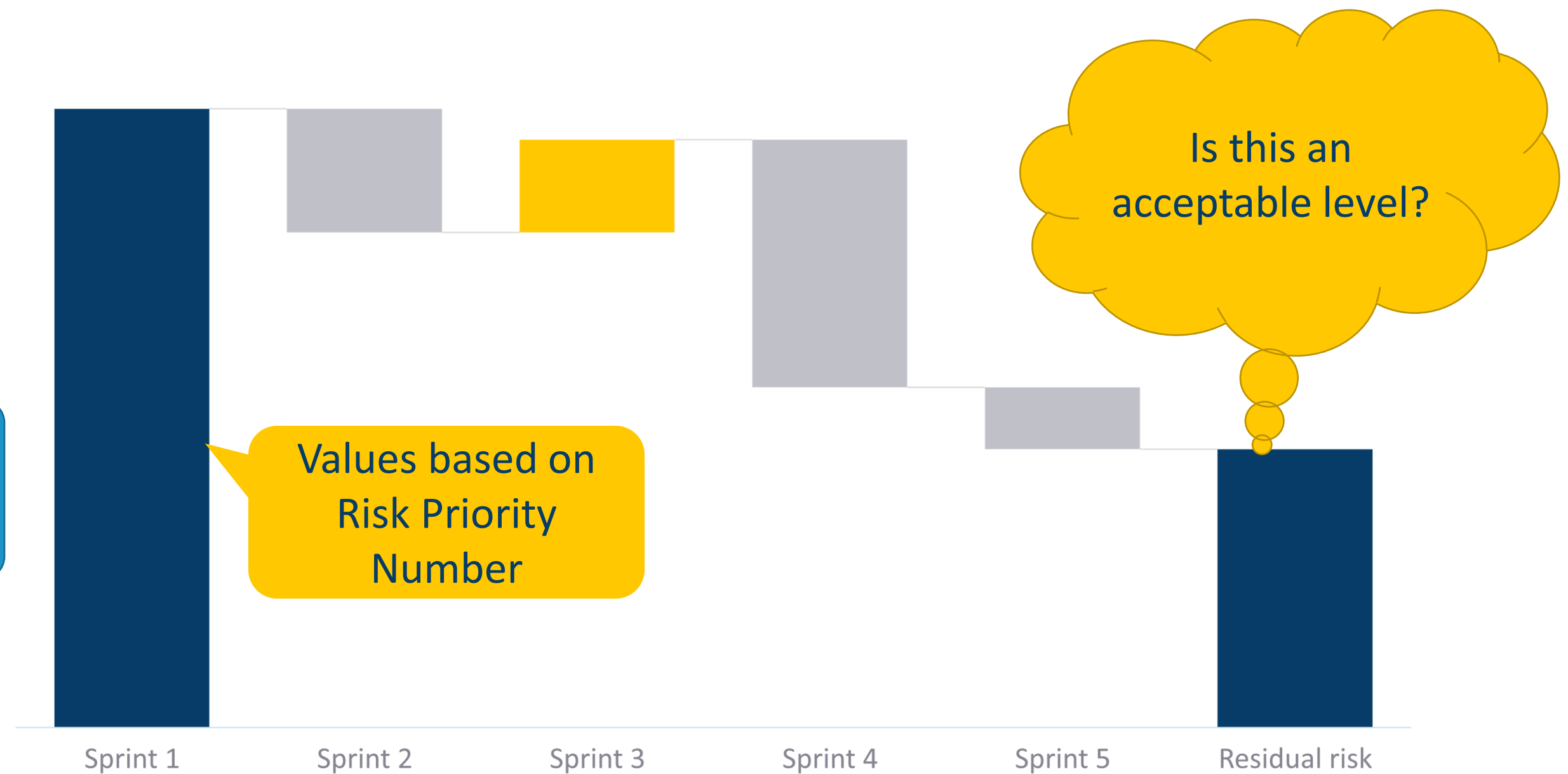
And how to report?



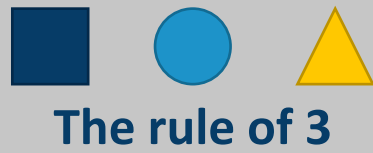
And how to report?

Waterfall charts can help in visualizing risk mitigation activities ...

... but has some drawbacks



1. Three steps
2. Three mappings
3. Three visualizations



TEST, IDENTIFY & (RE-)ASSESS



Run tests

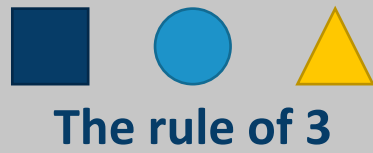


Identify new risks
(if any)



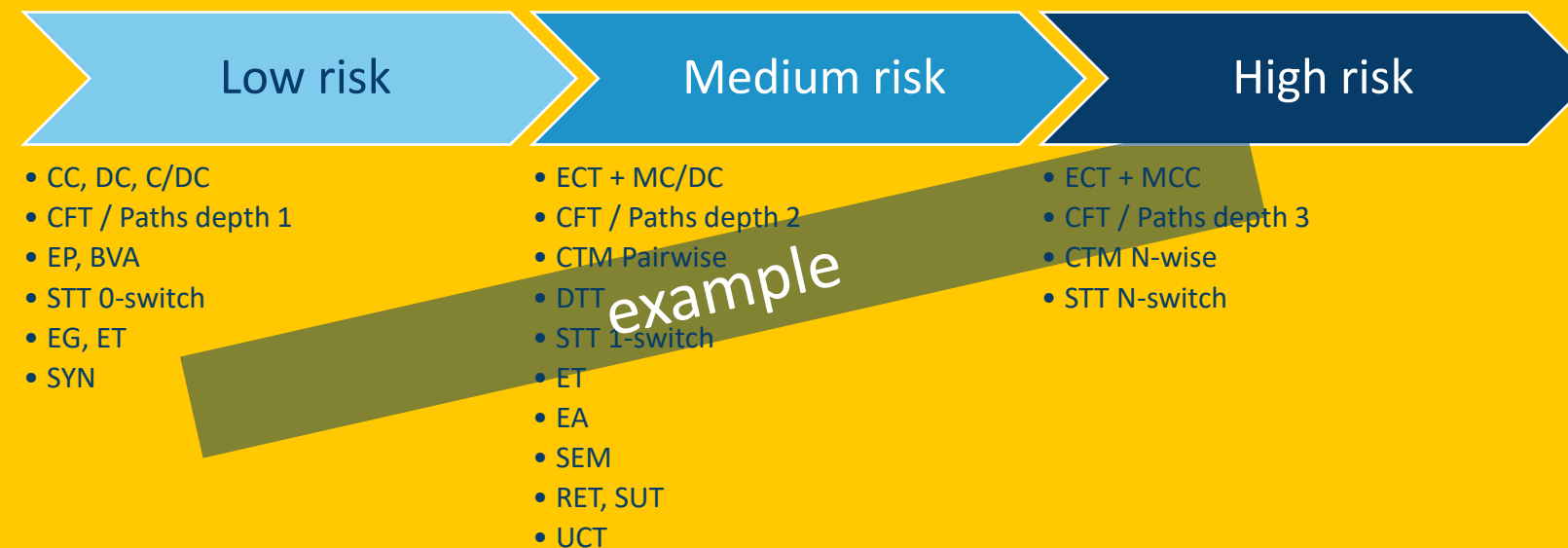
Assess new risks
and risk being
mitigated

1. Three steps
2. Three mappings
3. Three visualizations



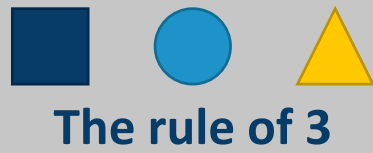
Map EFFECTS, CAUSES and RISK LEVELS

1. The effect is triggered by an event, transition, state, path, CRUD actions, ...
→ Map effects to Coverage Items
2. The cause will be found in a function, an interaction, a workflow, ...
→ Map Causes to Test Levels
3. The Risk Level determines the required thoroughness of testing
→ Map Risk Levels to Test Design Techniques



example

1. Three steps
2. Three mappings
3. Three visualizations



INITIAL STATUS, CURRENT STATUS, TREND and/or TRANSITION



Initial status

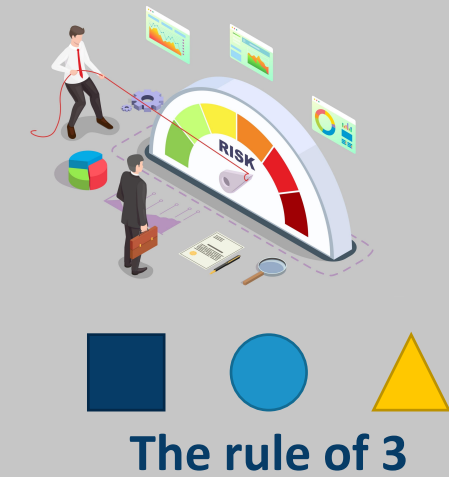


Trend / transition



Current status





1. Three steps

1. Test
2. Identify
3. (Re-)assess

2. Three mappings

1. Effects to Coverage Items
2. Causes to Test Levels
3. Risk Levels to Test Design Techniques

3. Three visualizations

1. Initial assessment
2. Current assessment
3. Transition and/or trend



RISK IDENTIFICATION

- Three concepts
- Three words
- Three techniques



RISK ANALYSIS

- Three words
- Three levels
- Three techniques



RISK EVALUATION OR CONTROL

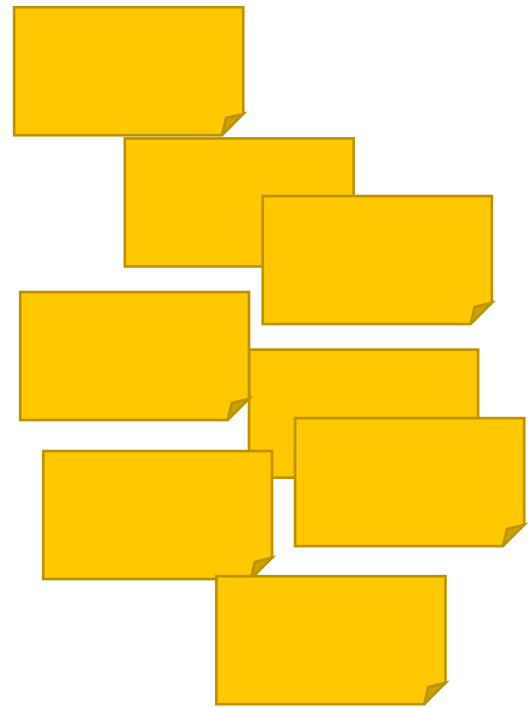
- Three steps
- Three mappings
- Three visualizations



① Risk Identification



The rule of 3



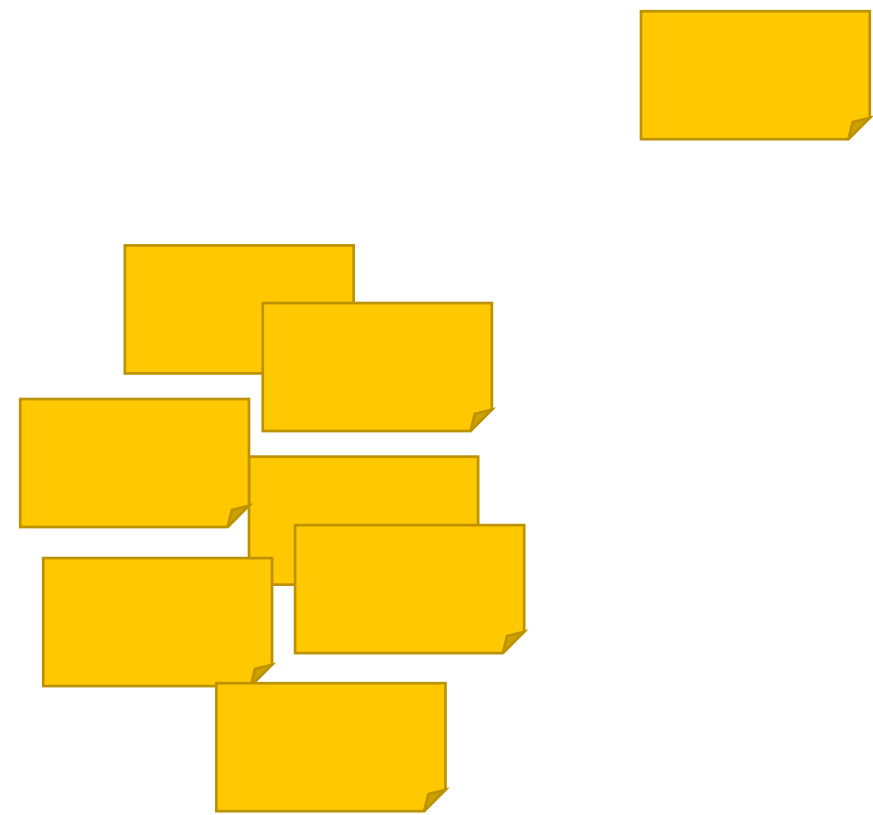
Use 3 concepts, 3 words and 3 techniques!



② Risk Assessment



The rule of 3



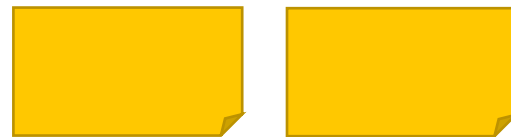


② Risk Assessment

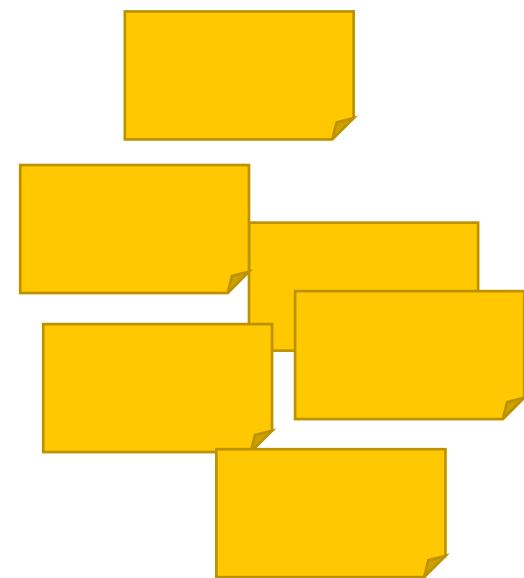


The rule of 3

Higher risk than
1st one?



Or lower?





② Risk Assessment

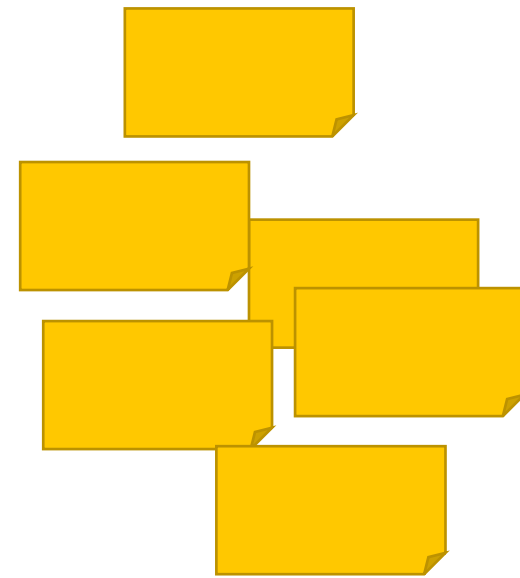


The rule of 3

Higher risk than
1st one?



Or lower?



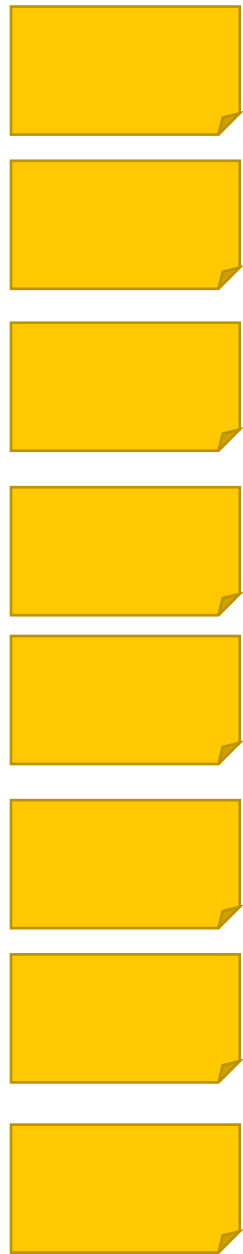
3 words:
Good is good
enough!






② Risk Assessment



The rule of 3



② Risk Assessment

  
The rule of 3

Unacceptable above



Acceptable below

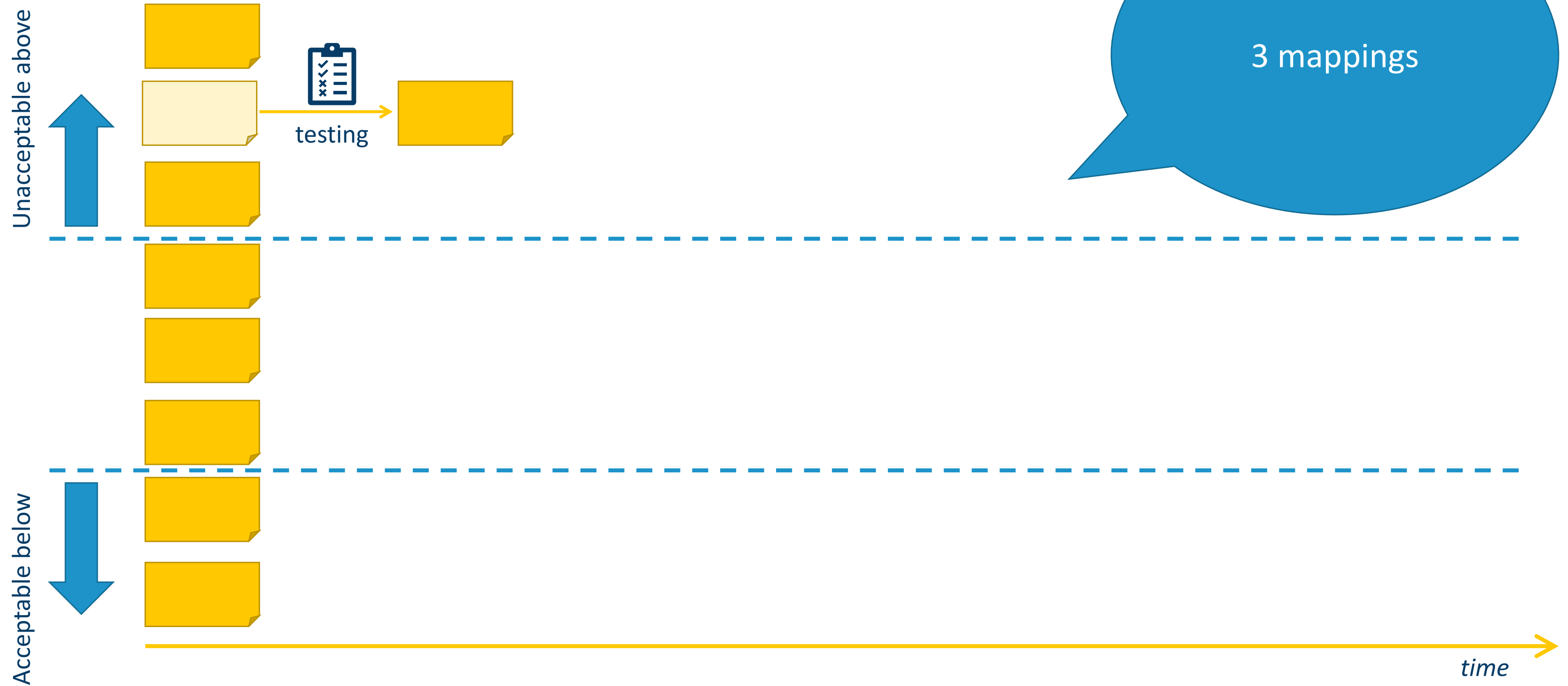


3 levels:
High
(unacceptable), Low
(acceptable) and
Medium (to be
discussed)



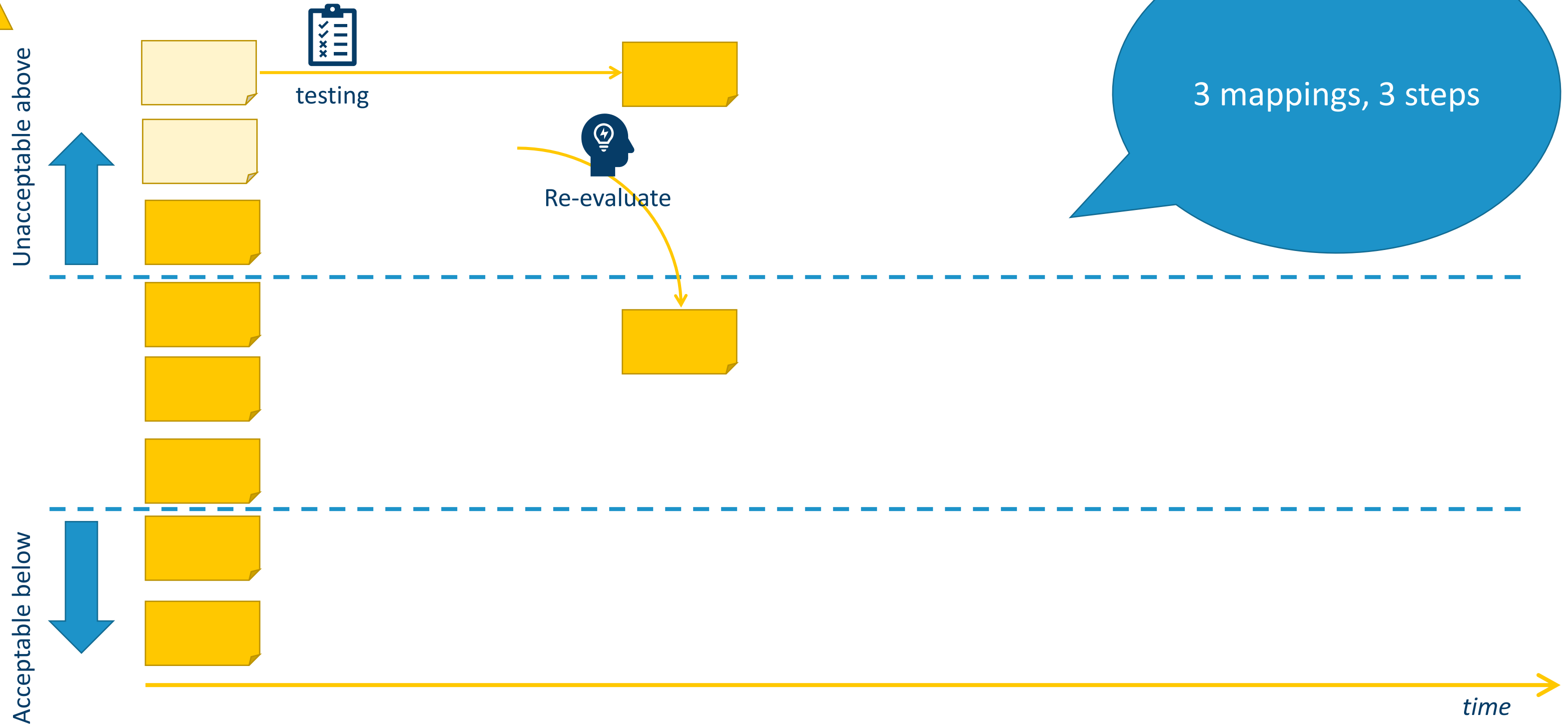
③ Risk Evaluation or Control

■ ● ▲
The rule of 3



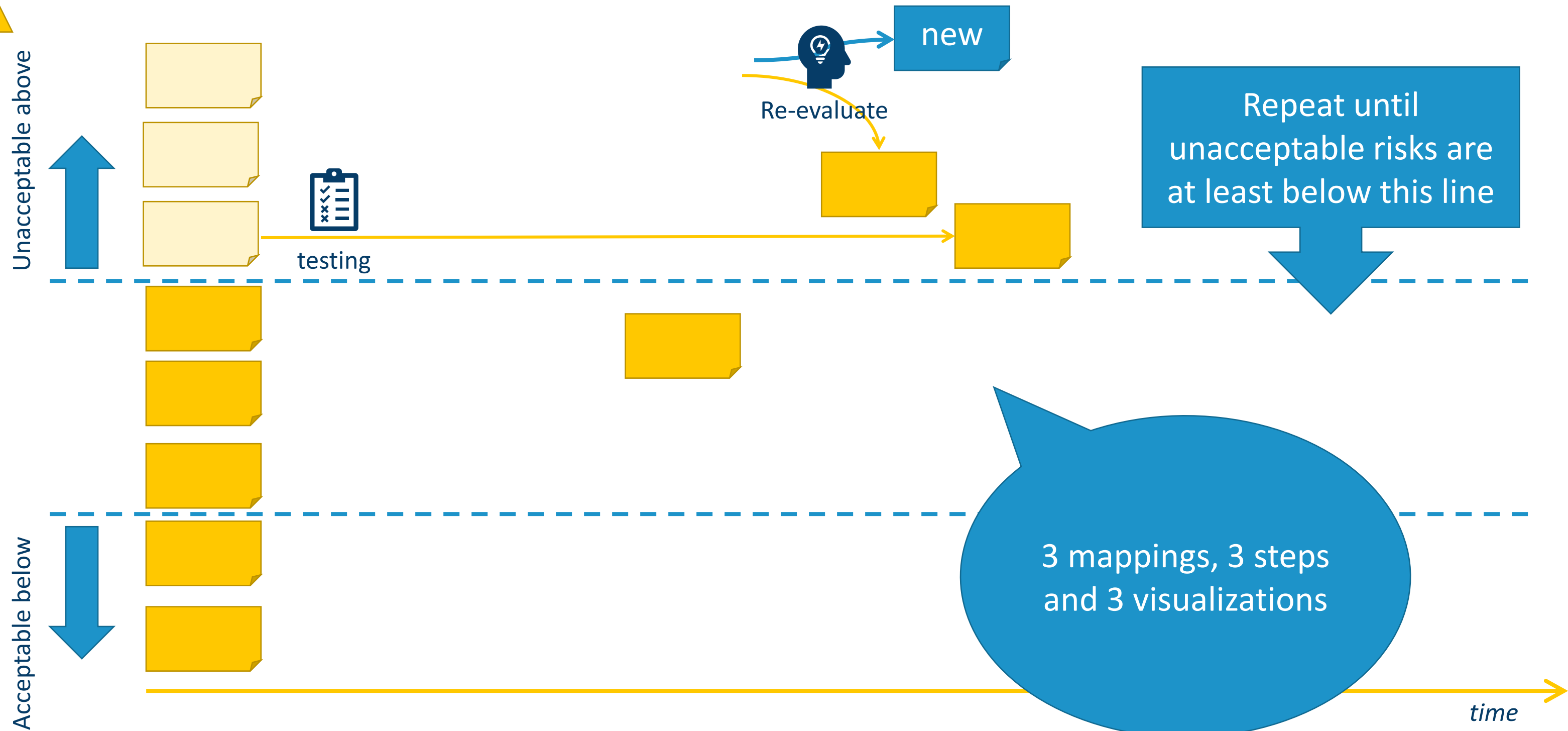
③ Risk Evaluation or Control

■ ● ▲
The rule of 3



③ Risk Evaluation or Control

■ ● ▲
The rule of 3





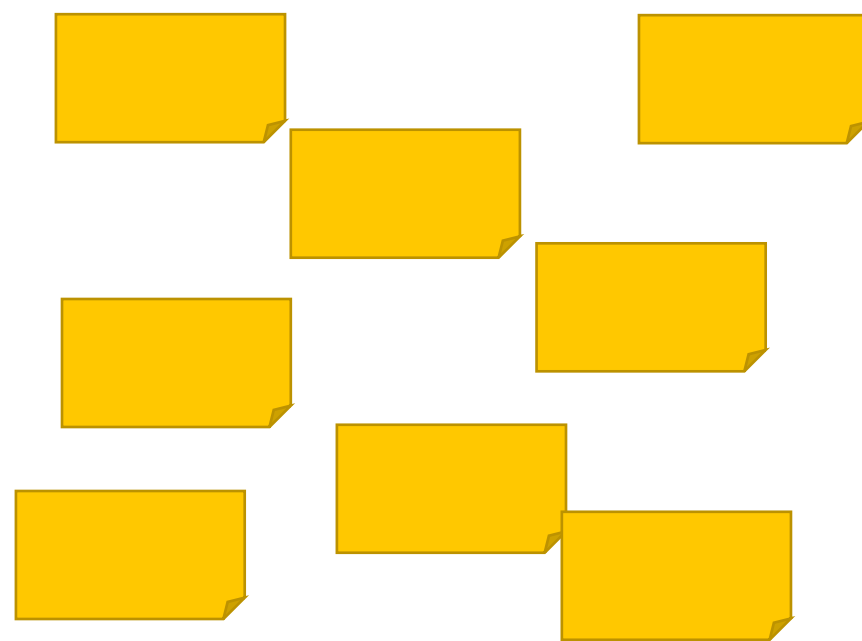
RISK IDENTIFICATION



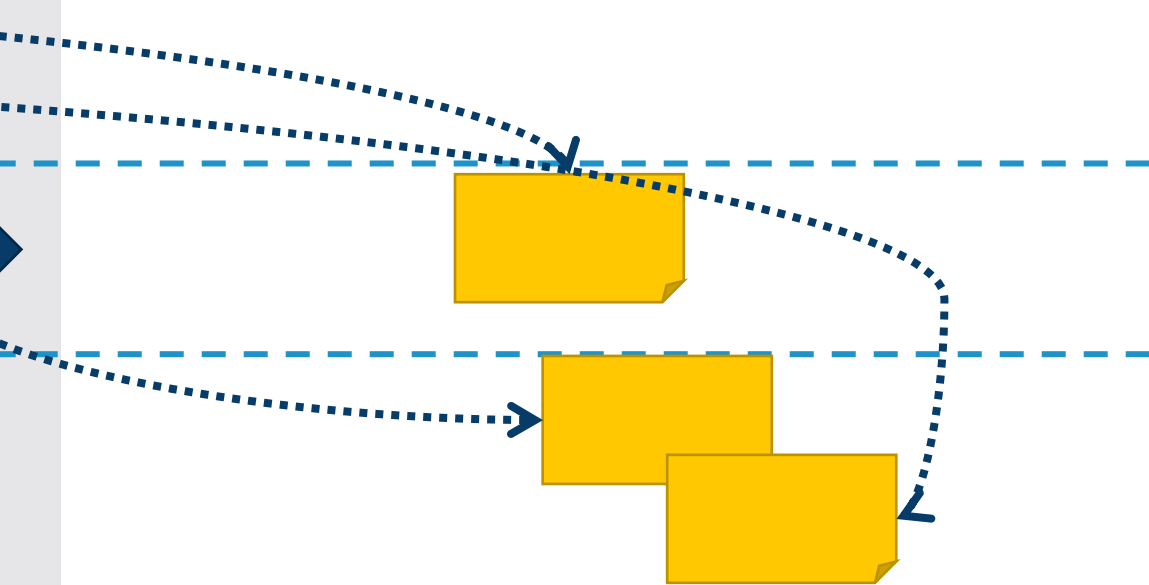
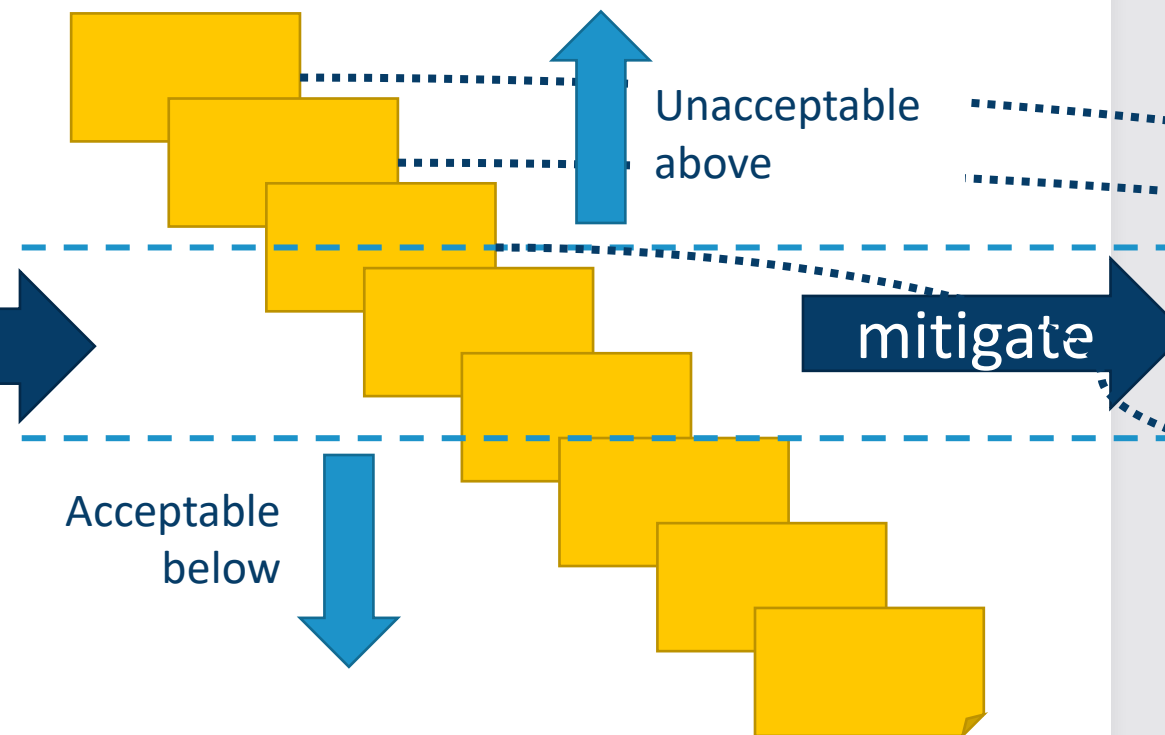
RISK ANALYSIS



RISK EVALUATION OR CONTROL



order



Thank you for your attention

