



Concept Research Programme



## *Estimation of* **UNKNOWN UNKNOWNNS** *Get closer to Reality/Certainty*



HKS consult  
ROBUSTE BUDGETTER & PLANER


Sept. 22<sup>nd</sup> 2022



NTNU – Trondheim  
Norwegian University of  
Science and Technology



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## Background



### Uncertainties

- Even if we use the Successive method and do our best, there is a risk that the **estimation does not cover all uncertainties**.
- Therefore, one can try to estimate the **Unforeseen** (what one has forgotten) and not at least the **Unforeseeable** (Unknown Unknowns).
- Henrik suggests in a simple way to estimate Unknown Unknowns. Thereby, the **probability of overruns can be reduced**.
- Further, the project organisation gets more aware of the stochastic uncontrollable nature of projects.
- The **method is generic**, and to be used for all kinds of projects.



Unknown Unknowns

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**Samples – in a stochastic world**



**On the job and in private...**



Unknown Unknowns

3

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**Sample**



**Here is one!  
Where is it...?**

**Note down where you think it is.**




Unknown Unknowns

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## Topics



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### Agenda

1. **Why do we often underestimate uncertainties?**
2. What are Unknown Unknowns?
3. How do we identify & estimate Unk Unks?
4. Q & A's




Unknown Unknowns

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

## Why?



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### Top 5 main reasons

1. The analysis group consist of too few people
2. We are focusing on what we know
3. The human brain wants fast and easy solutions
4. "People don't like to talk about, what they don't know"
5. Cultural barriers: Country, organization and people



Daniel Kahneman

Prof. Ole Jonny Klakegg

Hofstede Insights  
Geert Hofstede

Unknown Unknowns

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**Topics**

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**Agenda**

1. Why do we often underestimate uncertainties?
2. **What are Unknown Unknowns?**
3. How do we identify & estimate Unk Unks?
4. Q & A's



Unknown Unknowns

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**What are Unk Unks?**

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|              | Knowledge      | No Knowledge     |
|--------------|----------------|------------------|
| Consious     | Known Knowns   | Known UnKnowns   |
| Non Consious | UnKnown Knowns | UnKnown UnKnowns |

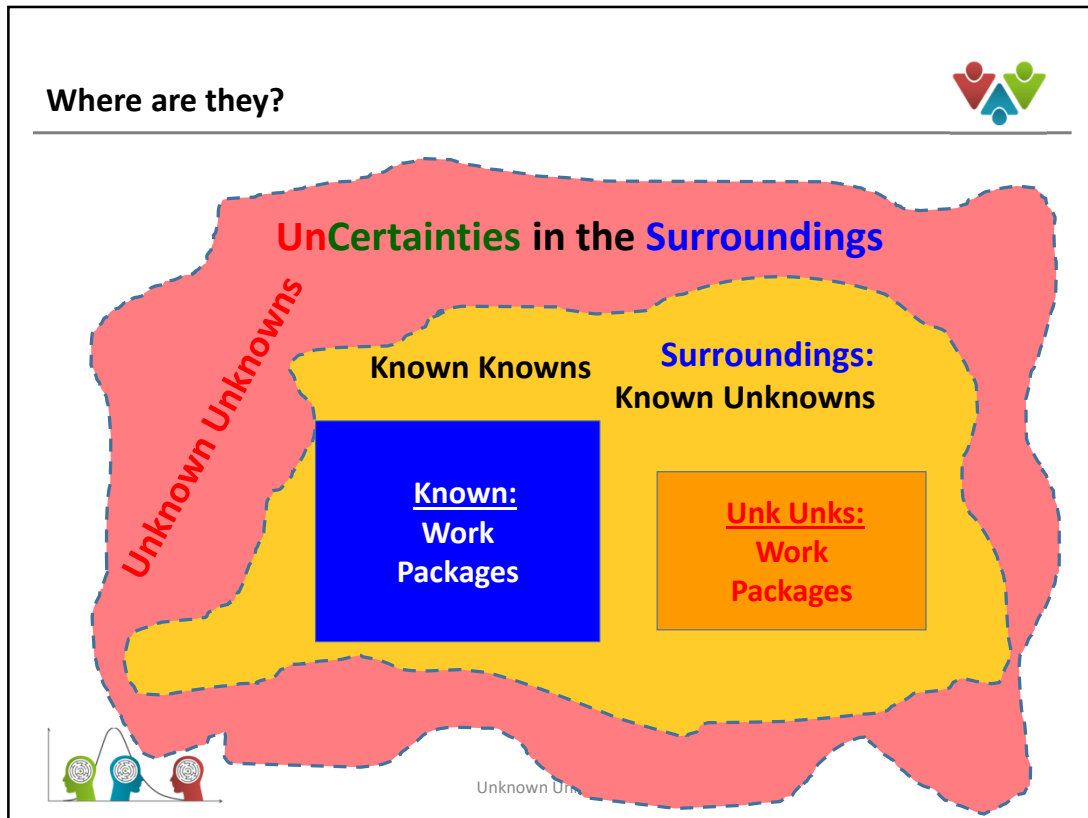
*Inspiration: Johari's window*



Unknown Unknowns

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### Topics


#### Agenda

1. Why do we often underestimate uncertainties?
2. What are Unknown Unknowns?
- 3. How do we identify & estimate Unk Unks?**
4. Q & A's

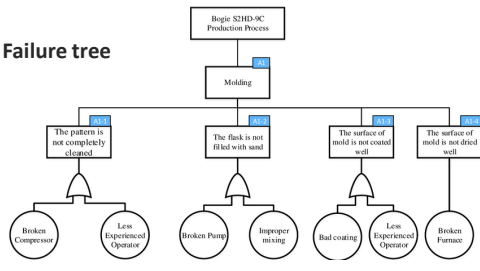
Unknown Unknowns

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### Traditional approaches



**Failure tree**




researchgate.net




Reliableplant.com

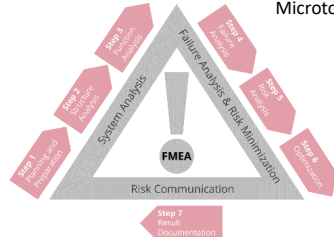
**Arrange, Act and Assert (AAA) Pattern**



Dzone.com




Guru99.com



Microtool.de


**Failure Mode Effect Analysis**



Unknown Unknowns

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### Simple recipe



Recall a **previous** project with Unk Unks

➔

Triple estimate **number** of the Unk Unks

➔

Triple estimate **man hours/task** of the Unk Unks

**Calculate** the Unk Unks

➔

Choose a **confidence** level → Unk Unks budget

➔

**Add** the Unk Unks budget to the project budget

**During project execution**

You **discover** an Unk Unk and it get's a Known Unk

➔


You **triple estimate** the Known Unk

➔

You **add** the Known Unk budget to the project budget


You **reduce** Unk Unks budget

↓



Unknown Unknowns


**First: Establish a Broad Spectrum Analysis Group**




**CREATIVE, REALISTS, PESSIMISTS**  
Internal, External, various skills and experiences

**FACILITATOR**


Maintain disagreement –  
**Get the best result!**



Invite fictive people – That could not participate.



Imagine how they would think...


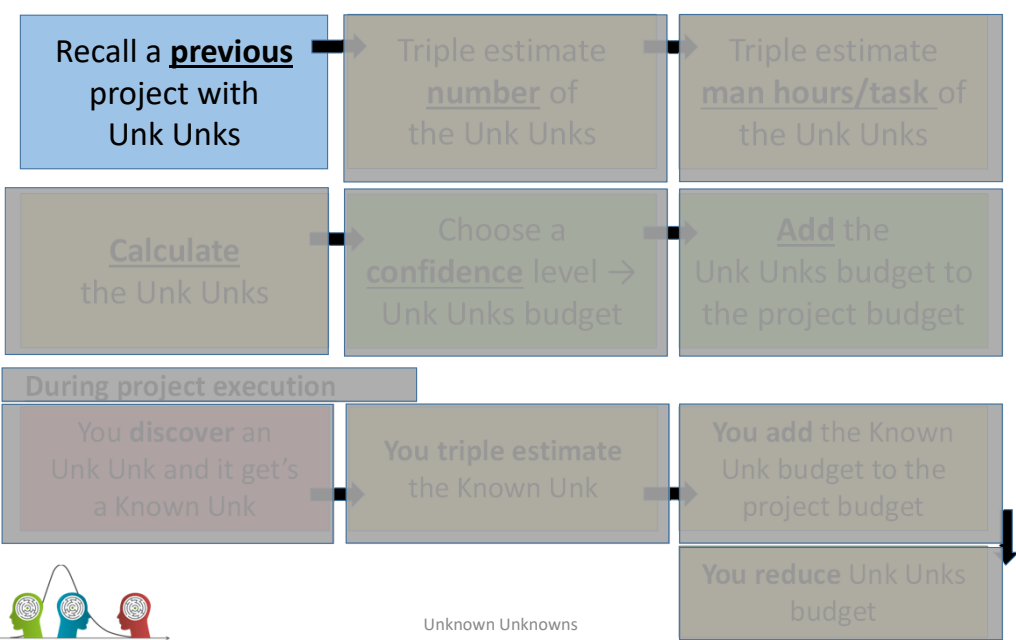


Unknown Unknowns

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**Procedure**

Recall a **previous** project with Unk Unks

Triple estimate **number** of the Unk Unks

Triple estimate **man hours/task** of the Unk Unks

**Calculate** the Unk Unks

Choose a **confidence** level → Unk Unks budget

**Add** the Unk Unks budget to the project budget


**During project execution**

You discover an Unk Unk and it get's a Known Unk

You triple estimate the Known Unk

You add the Known Unk budget to the project budget

You reduce Unk Unks budget




Unknown Unknowns

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**Begin...**








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**FRAMING OF THE PARTICIPANTS:**

- What happened in a similar project lately?
  - Did some Unk Unks pop up?
- Imagine that this will happen in some extend in this particular project.....

**RULES:**


- Avoid baising each other
- Use a broad spectrum group
- Use a facilitator to guide the process

Unknown Unknowns 15

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**Simple recipe**




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Recall a **previous** project with Unk Unks → Triple estimate **number** of the Unk Unks → Triple estimate **man hours/task** of the Unk Unks

Calculate the Unk Unks → Choose a **confidence** level → Add the Unk Unks budget to the project budget

**During project execution**

You discover an Unk Unk and it get's a Known Unk → You triple estimate the Known Unk → You add the Known Unk budget to the project budget

You reduce Unk Unks budget

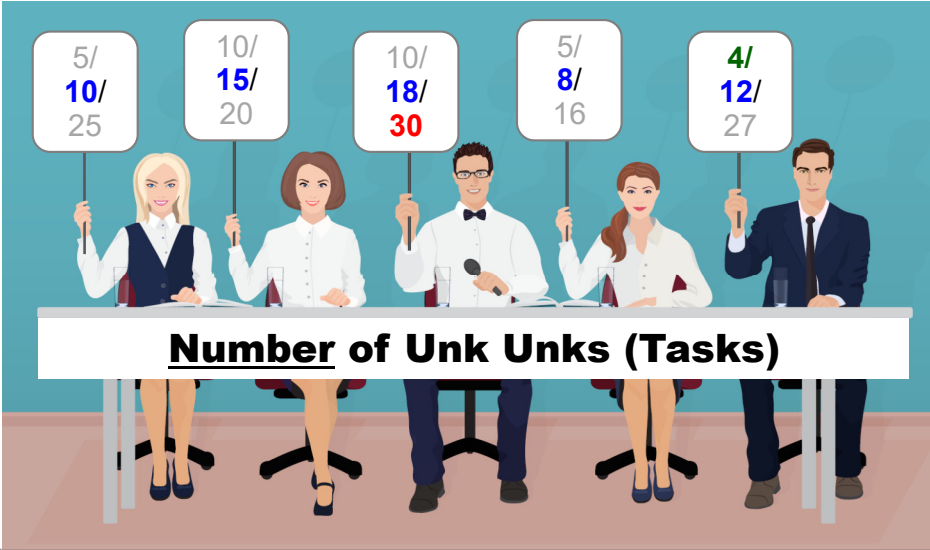


Unknown Unknowns

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Estimation



5/  
**10**/  
25

10/  
**15**/  
20

10/  
**18**/  
**30**

5/  
**8**/  
16

**4**/  
**12**/  
27

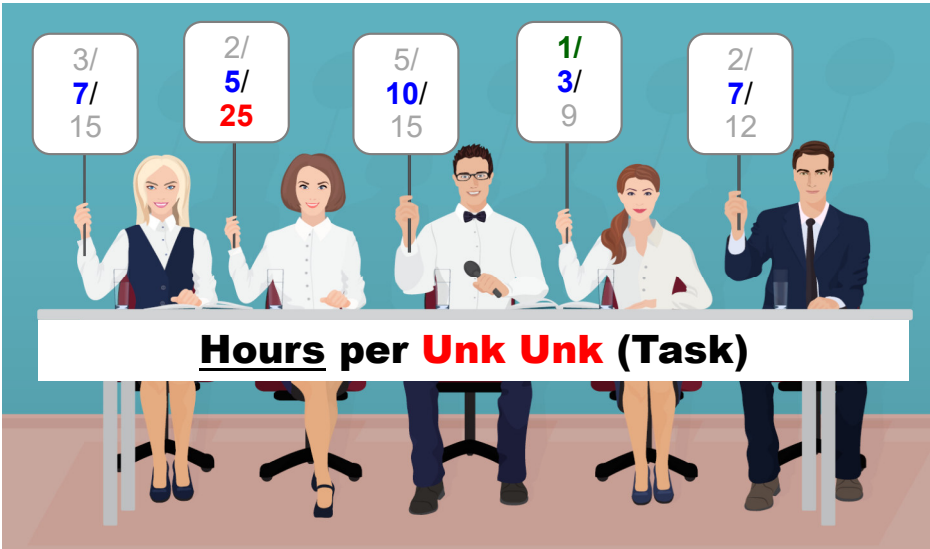
**Number of Unk Unks (Tasks)**

Result: **Min**/ML/**Max**: **4**/ 13/ **30**

Unknown Unknowns 17

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Estimation



3/  
**7**/  
15

2/  
**5**/  
**25**

5/  
**10**/  
15

**1**/  
**3**/  
9

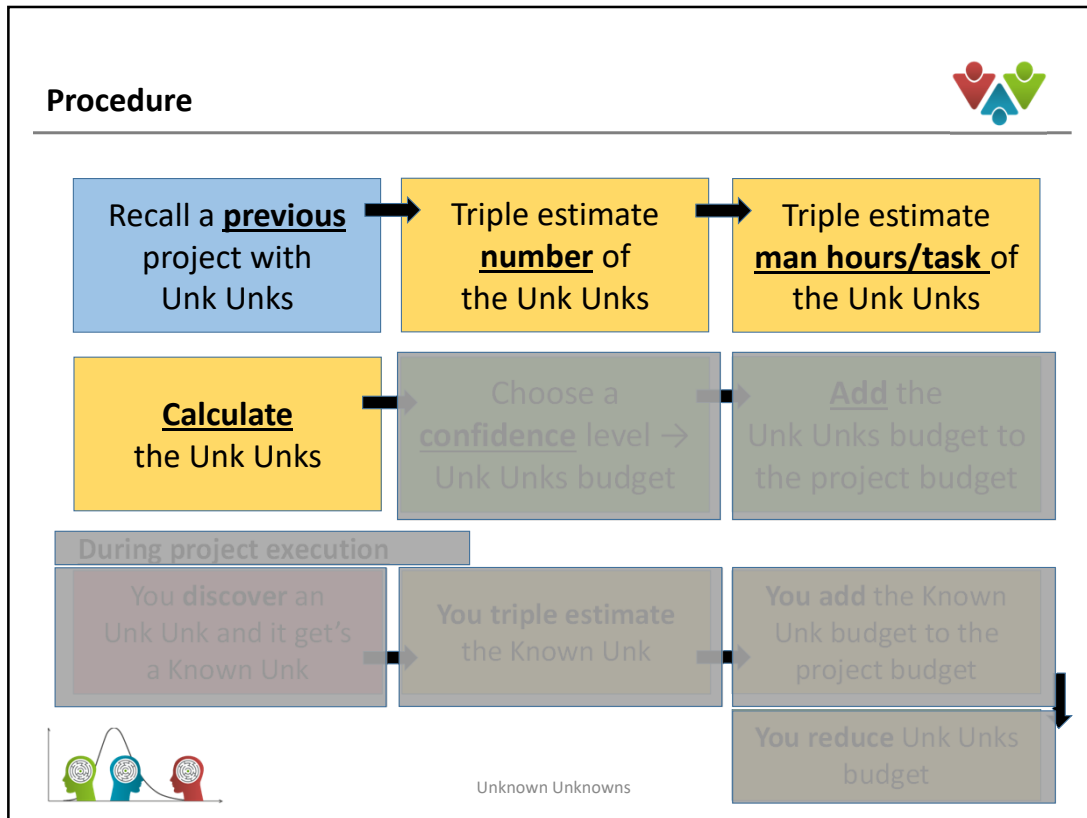
2/  
**7**/  
12

**Hours per Unk Unk (Task)**

Resultat: **Min**/**MS**/**Max**: **1**/ **6**/ **25** hours

Unknown Unknowns 18

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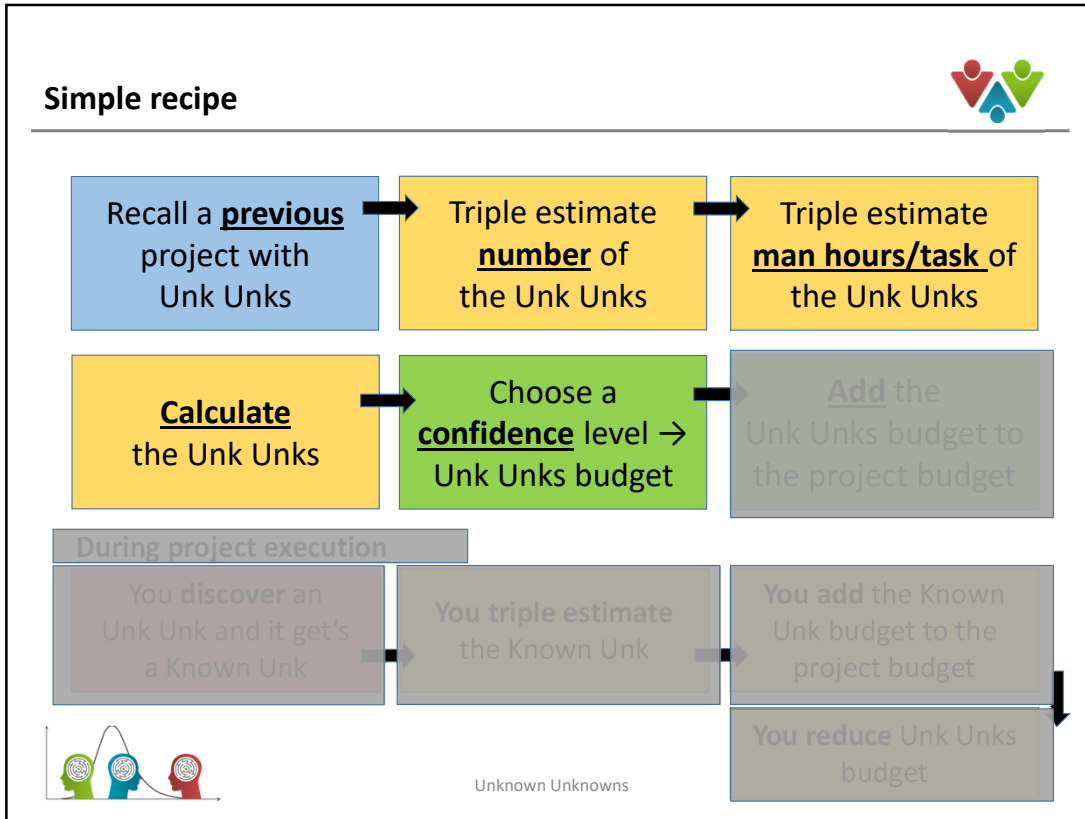
### Calculations

| ESTIMERING AF UNK UNKS. |                            | Min                       | M.L.       | Max   | Units      |
|-------------------------|----------------------------|---------------------------|------------|-------|------------|
| Un.Un.                  | Number of Unknowns         | 4                         | 13         | 30    | Number     |
|                         | UnKnowns: Tasks            |                           |            |       |            |
|                         | Value per Unknowns Unknown | 1,0                       | 6,4        | 25,0  | Hours/task |
|                         | <b>Unknowns UnKnowns</b>   | -79,0                     | 132        | 343   | 84,4       |
|                         | Relative values            | -60%                      | 100%       | 260%  | Std        |
|                         |                            |                           | Robust'ish |       | No. * Std. |
|                         | <b>BUDGET Unk Unks</b>     | 75,0%                     | <b>189</b> | Hours | 0,67       |
|                         |                            | Budget= Mean + 0,67*StDev |            |       |            |

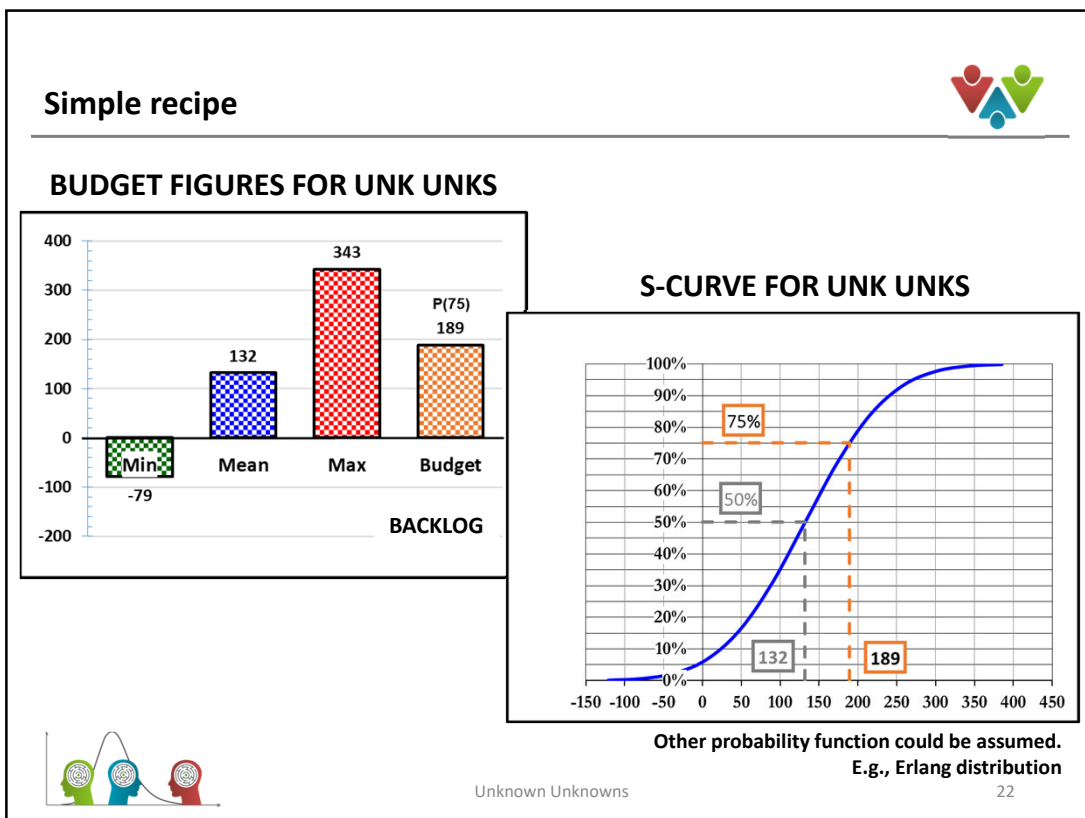
**Note:** Unk Unks can have a positive effect e.g., reducing costs

Unknown Unknowns

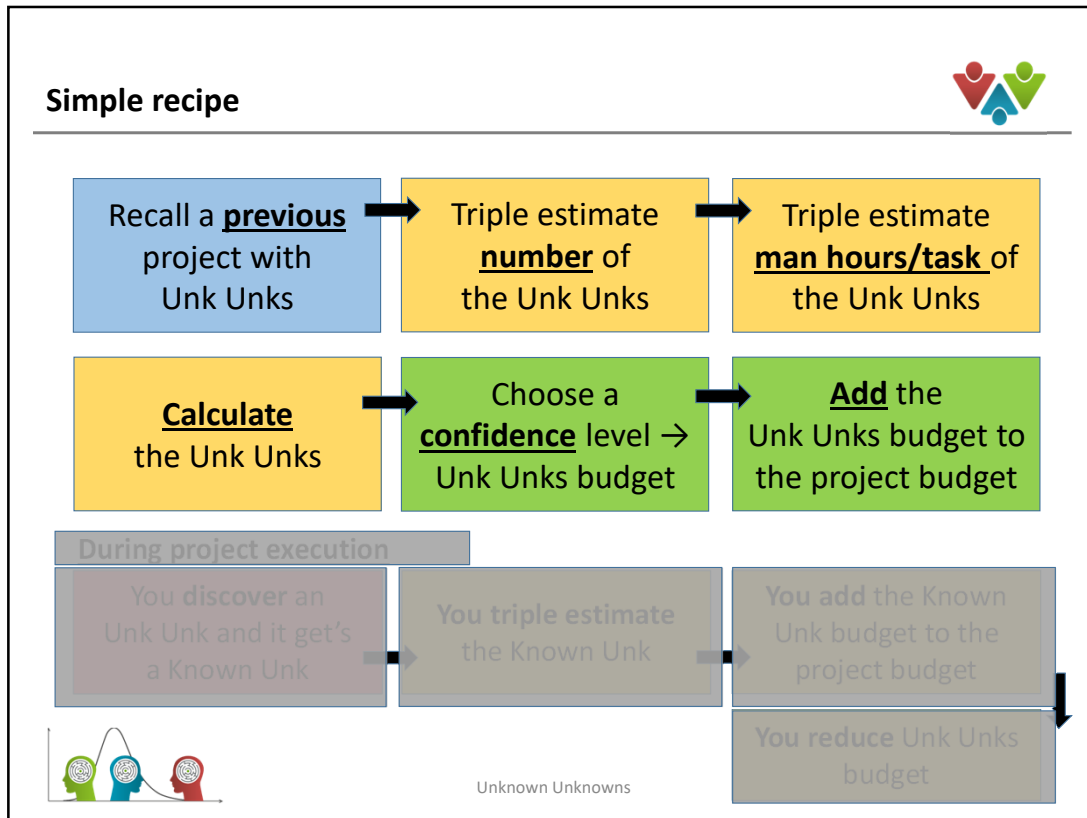
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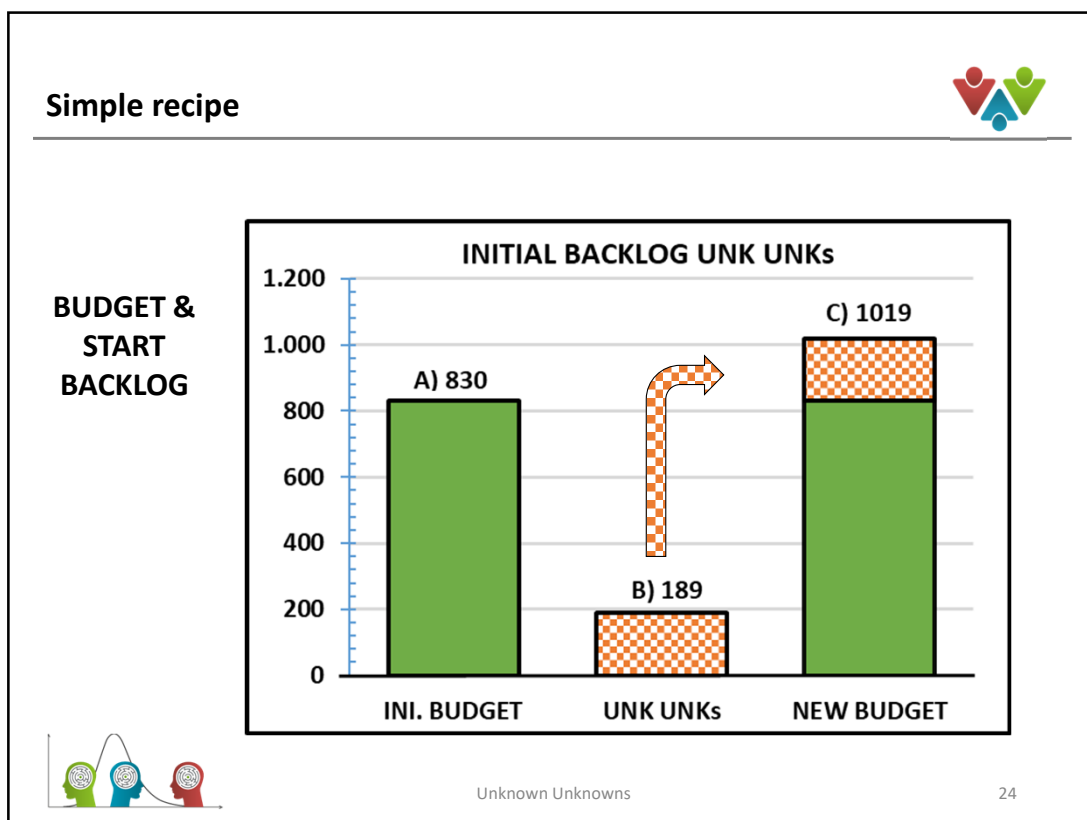
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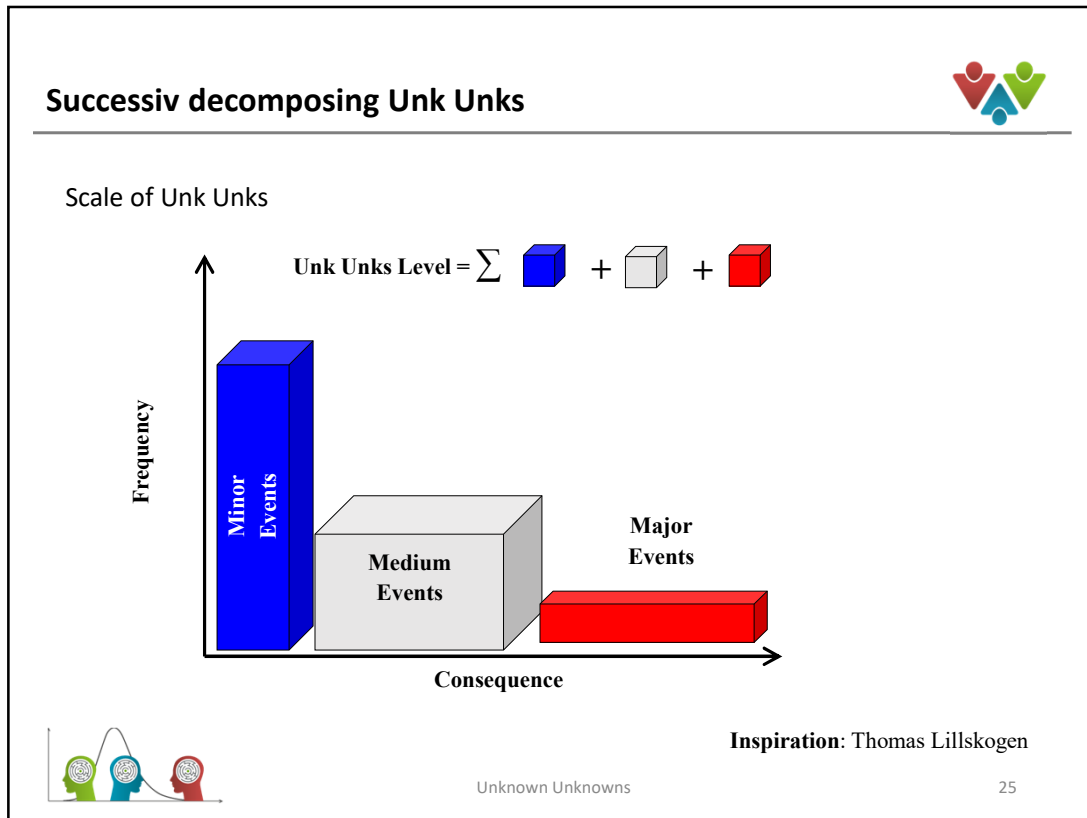
22



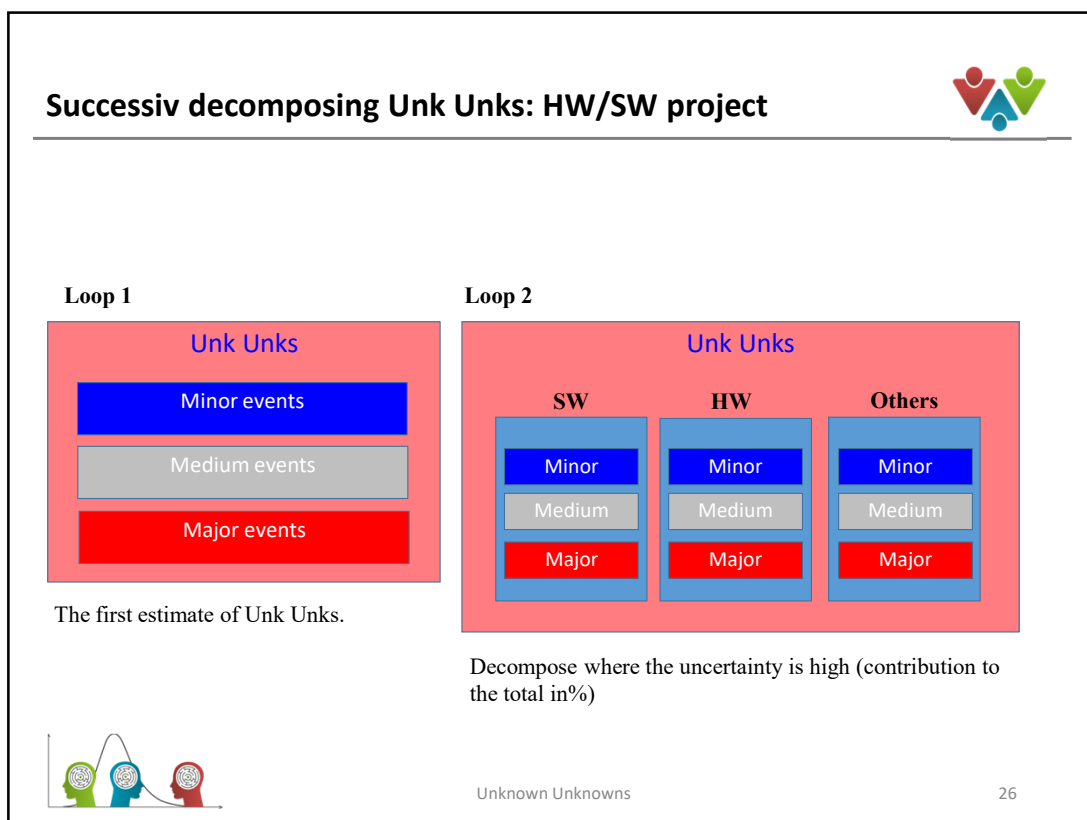
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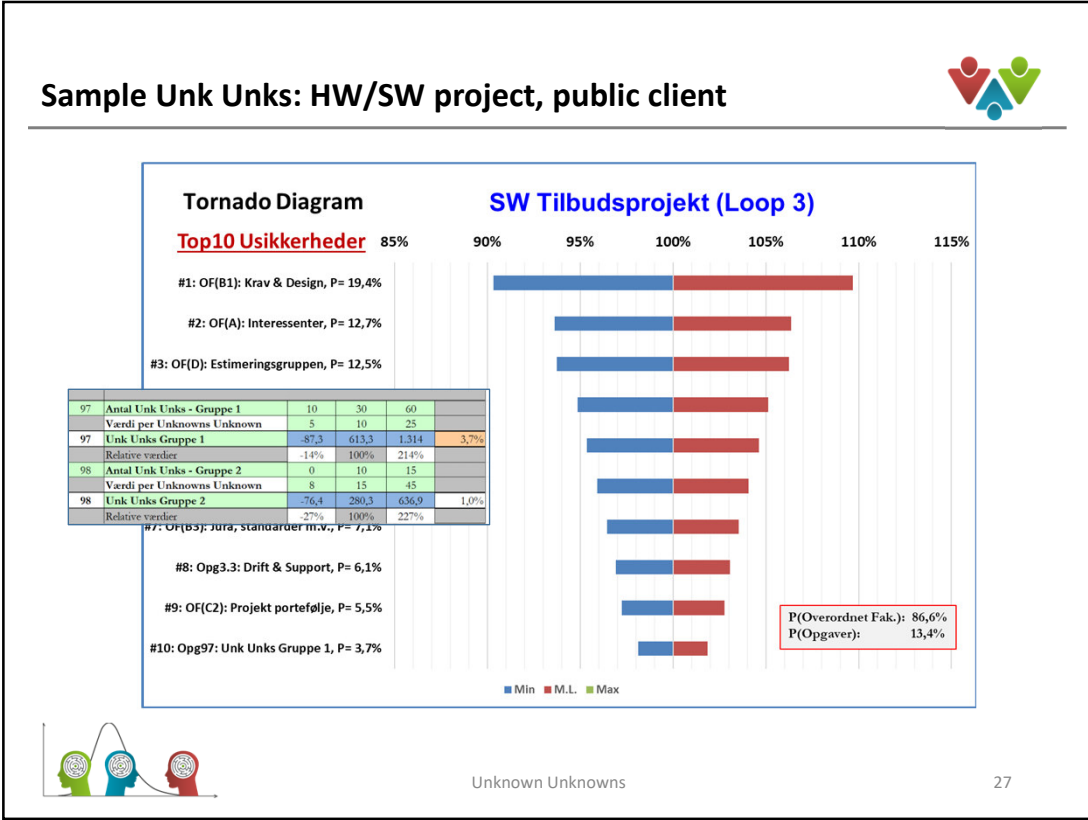
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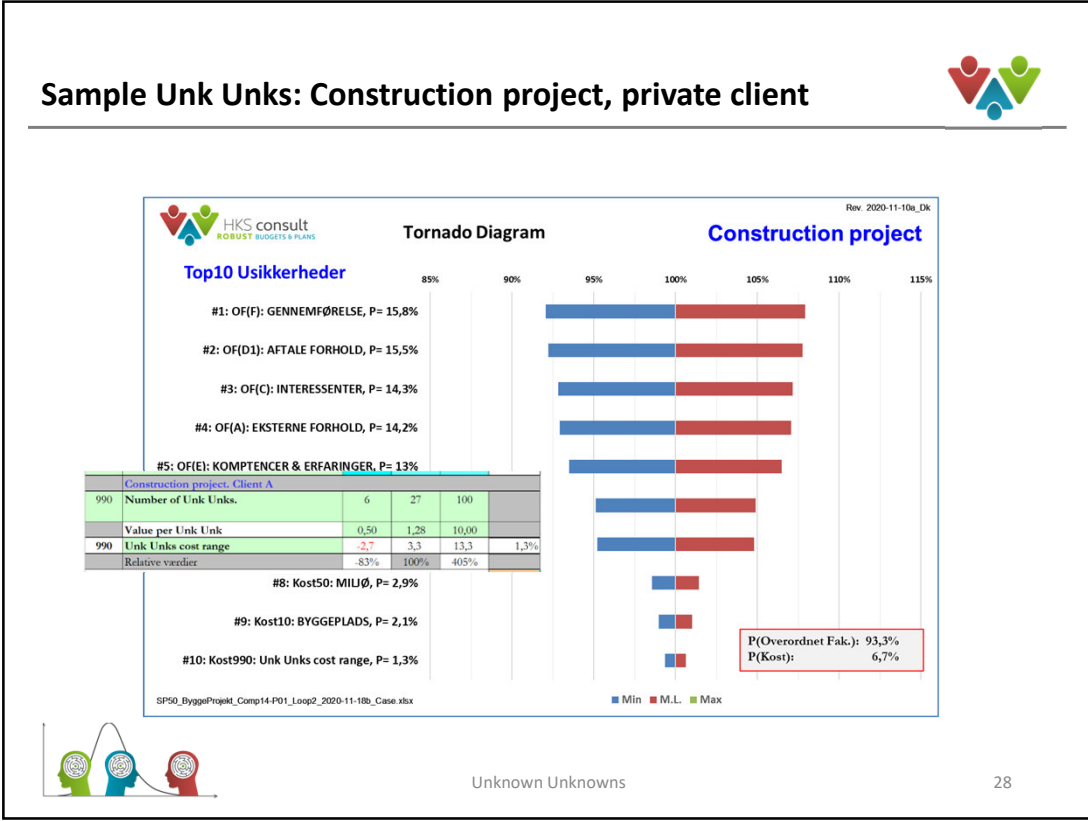
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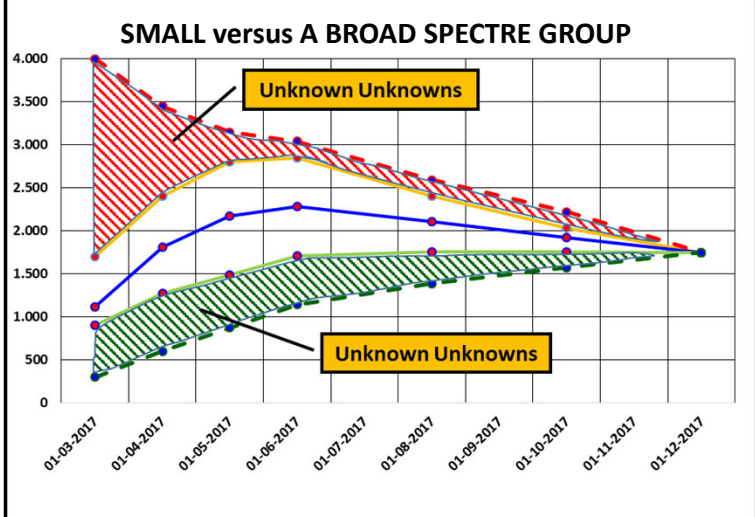


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**Sample: A broad spectre analysis group do a difference**



**Discover more:  
Unknown Unknowns**




A major HW/SW project: Controller platform

Unknown Unknowns 29


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**Getting further: PMI article**



### ‘Characterizing unknown unknowns’

|                            |             |                                    |                                     |            |
|----------------------------|-------------|------------------------------------|-------------------------------------|------------|
| Identification \ Certainty |             | Certain (Known)                    | Uncertain (Unknown)                 |            |
|                            |             |                                    | Impact                              | Occurrence |
| Identified (Known)         |             | Known known (identified knowledge) | Known unknown (identified risk)     |            |
| Unidentified (Unknown)     | Consequence | Unknown known (untapped knowledge) | Unknown unknown (unidentified risk) |            |
|                            | Event       |                                    |                                     |            |



mars.nasa.gov/mars2020/

**Exhibit 2: Extension of Unknowns**

|                            |         |              |             |
|----------------------------|---------|--------------|-------------|
| Knowledge gap Separated by | Ignored | Inaccessible | Unavailable |
|                            | Space   | IS           | AS          |
| Time                       | IT      | AT           | VT          |
| Condition                  | IC      | AC           | VC          |
| Parts/whole                | IP      | AP           | VP          |

**Exhibit 3: Classifying “Unidentified”**

<https://www.pmi.org/learning/library/characterizing-unknown-unknowns-6077>
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## Why busy yourself with Unk Unks



### THE MAIN POINTS

Just dealing with Unk Unks:

- Enhance your awareness Unk
- Reduces the number of Unk Unks
- Supports that you are consciously searching for them
- Provides advance warnings in the project about the unknown surprises (nature of projects)

### Therefor:

- Implement the method as a natural part of the analyzes
- Inform the project stakeholders that Unk Unks. coming
- Include Unk Unks. in budget and schedule



Unknown Unknowns

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## Estimation of Unk Unks.



### Summary

1. Uncertainties are often underestimated
2. Include the Unforeseen and Unforeseeable (Unk Unks).
3. Use a simple approach
4. Compose a broad spectrum analysis group
5. Estimate the Unk Unks (eventual for more areas)
6. Define a backlog budget for Unk Unks.
7. Update the backlog budget, when Unk Unks are discovered




Unknown Unknowns

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## Topics



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### Agenda

1. Why do we often underestimate uncertainties?
2. What are Unknown Unknowns?
3. How do we identify & estimate Unk Unks?
4. **Q & A's**




Unknown Unknowns

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## Sharing knowledge



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### QUESTION

- What is your best way to identify Unk Unks?
  - Share with the person sitting at your right



Unknown Unknowns

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Aux 

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**Misc. slides**

 Unknown Unknowns 35


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You spotted one 

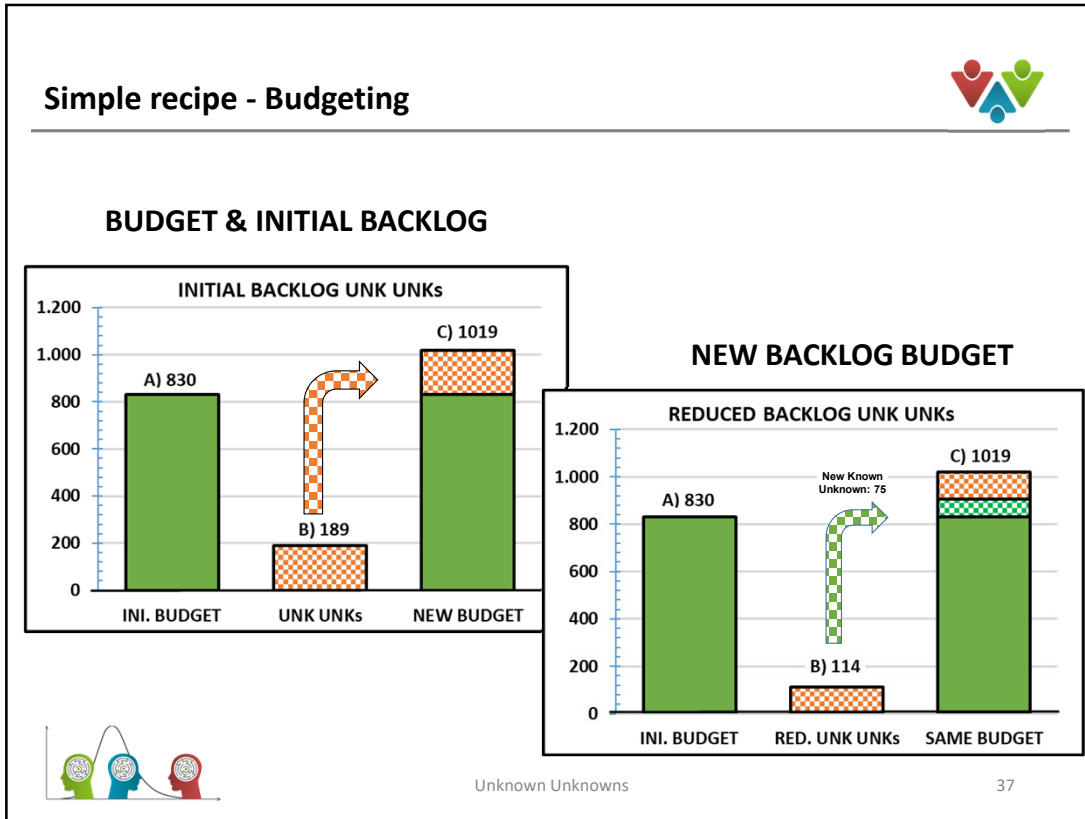
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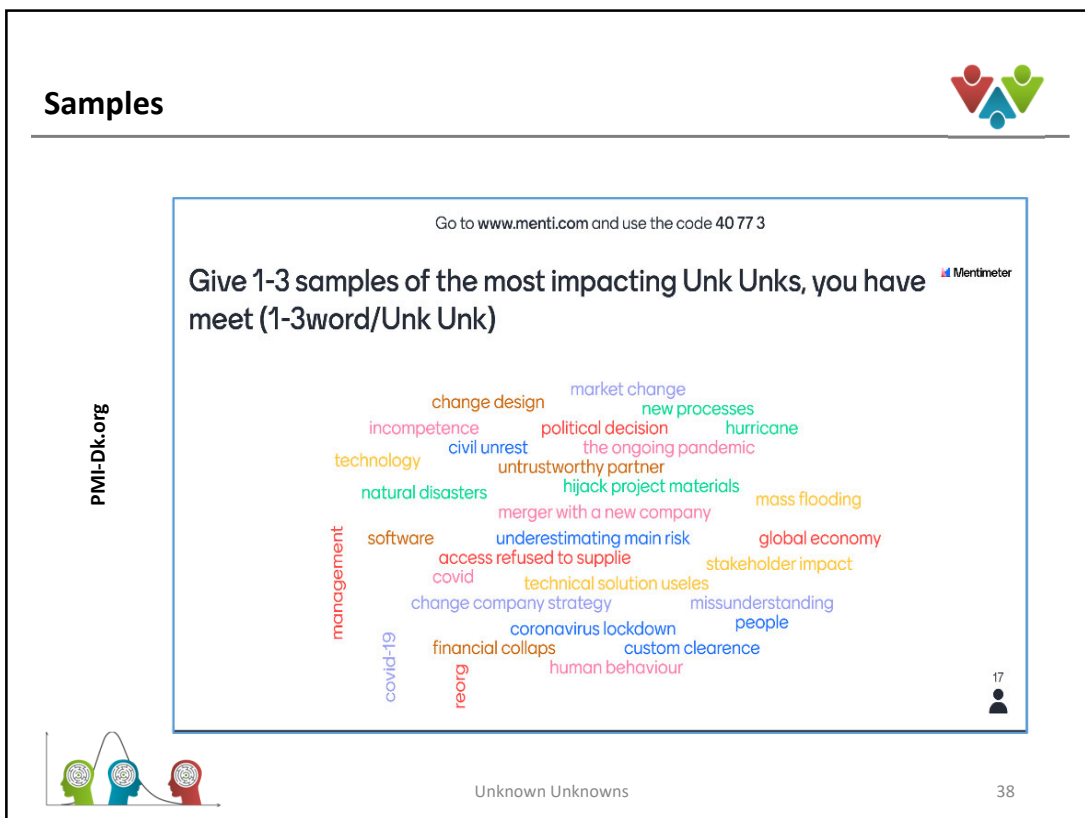
I've got to include it...  
By the way, now it's a  
**Known Unknown !**

 Unknown Unknowns 36

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### Broad Spectrum Analysis Group

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**Design, order components, test and sell a Swing**

What your management asked for

What you decided you needed

What your initial RFP asked for

What Global Procurement changed it to

How some leading vendors saw your RFP, so declined to bid

What marketing was already selling

What vendor #1 proposed

What vendor #2 proposed

When the procurement process ended

What you bought, even though price "wasn't the most important factor"

How the procurement decision was documented

How much you actually got out of the box

**Include multi perspectives.**

Unknown Unknowns

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### Development of knowledge – when beginning

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|                     |                       |                         |
|---------------------|-----------------------|-------------------------|
|                     | <b>Knowledge</b>      | <b>No Knowledge</b>     |
| <b>Consious</b>     | <b>Known Knowns</b>   | <b>Known UnKnowns</b>   |
| <b>Non Consious</b> | <b>UnKnown Knowns</b> | <b>UnKnown UnKnowns</b> |

Unknown Unknowns

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### Development of knowledge – when we're done?

|                 |                   |                     |
|-----------------|-------------------|---------------------|
|                 | Knowledge         | No<br>Knowled       |
| Consious        | Known<br>Knowns   | Known<br>UnKnowns   |
| Non<br>Consious | UnKnown<br>Knowns | UnKnown<br>UnKnowns |

Unknown Unknowns

You never get  
them all...

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### SP2022 Copenhagen Nov. 21 and 22.

**Successiv Konferencen**

12 værdifulde foredrag  
Bruger Cases & Forskning

Successiv Princippet har fordoblet overskuddet hos AF-gruppen.no

Entrepreneur

Successiv Princippet og risikomodelering. Ramboll.dk

Rådgiver

Successiv Princippet sikrede udbygning af svensk letbane til budget og tid! Norrkoping.se

Kommune

Norsk forskning: 80% af statslige projekter slutter under budget! NTNU.edu

Forsker

Norsk forskning: Successiv Princippet med fremtids-perspektiver! NTNU.edu

Forsker

Info – Arrangør Dk: Henrik@hks-consult.dk

The 11<sup>th</sup> user conference (in Scandinavian language)

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## Biography



### Henrik K. Søndergaard

- Henrik has worked with Successive Analyses over the past 10 years
- He makes analysis and gives lectures & webinars
- He has his own YouTube channel about the method 'Risk Management & EBIT Styring' (Uk: '..... & EBIT Control')
- He is co-author of the book used in for certification of Successive Facilitators
- In addition, he has translated Steen Lichtenberg's handbook into Danish.



Unknown Unknowns

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