



30th Annual **INCOSE**
international symposium

Virtual Event
July 20 - 22, 2020

Risk and Opportunity Management for Project Selection in the Road Construction Industry (Paper 115)



www.incose.org/symp2020

Authors



Martha Stisen

Master Student in Industrial Economy with Systems Eng
University of South-Eastern Norway, Campus Kongsberg



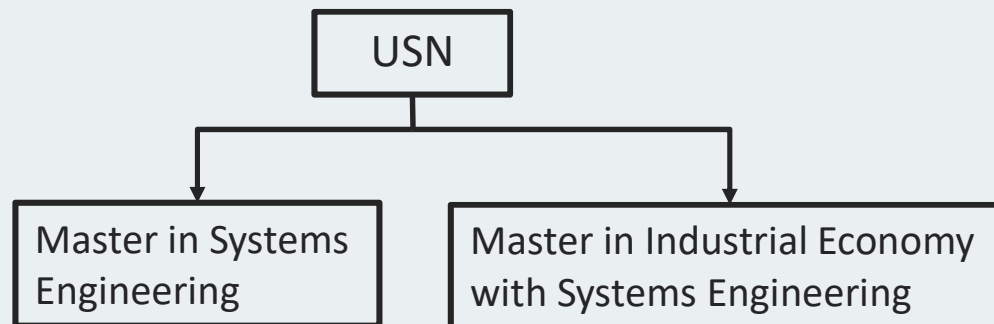
Elisabet Syverud

Associate Professor Systems Engineering
University of South-Eastern Norway, Campus Kongsberg



Introduction

- ❖ University of South-Eastern Norway (USN) offers Master Programs in Systems Engineering



- ❖ Master thesis project with 30 ECTS at the end of the study
 - Students have to show they can apply the theory in practice

The paper is based on Martha Stisen's Master Thesis 2019



Construction Industry

Construction industry is dynamic and risky.

- Majority of projects are financially successful.
- Projects with loss have significant impact on the company's financial performance.

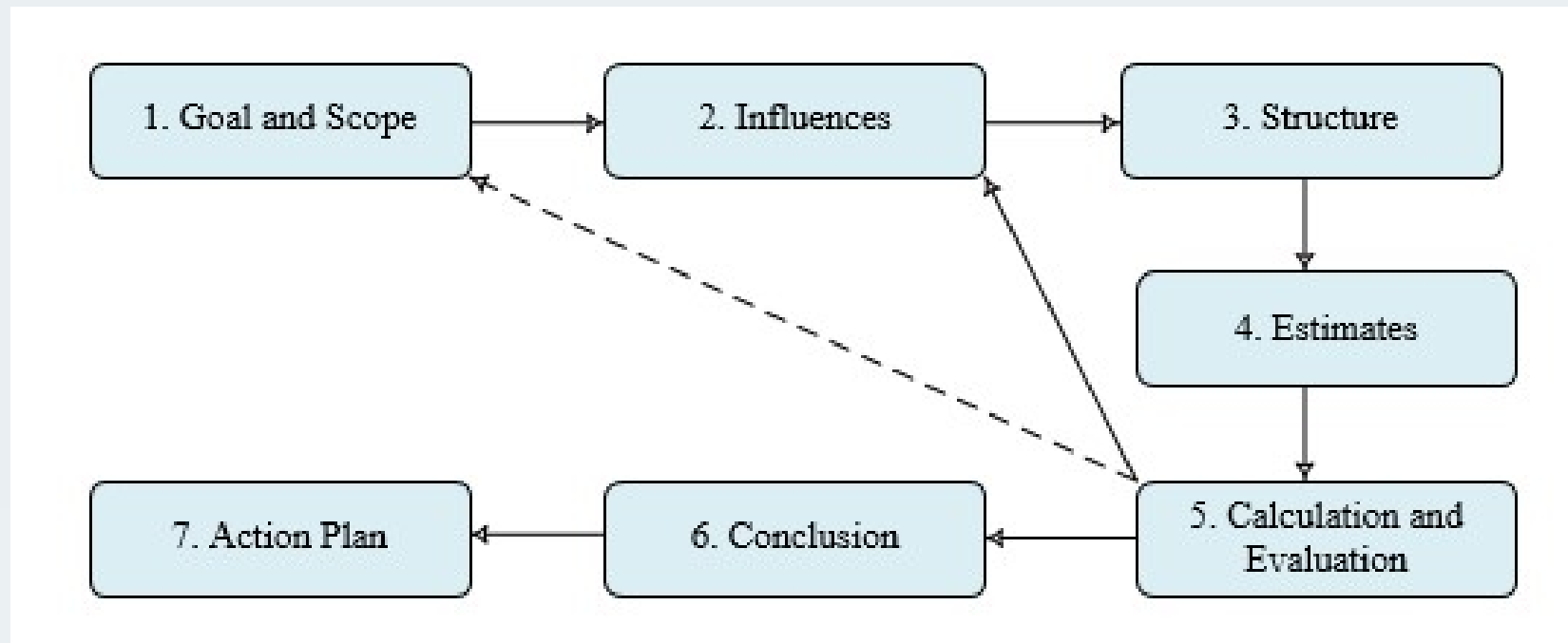
Crucial to uncover project risk as early as possible.



Photo: Statens Vegvesen



7 Step Principle of Risk and Opportunity Management



[Ref. Austeng, et.al 2010]



Research Questions

How can construction companies improve their ability to choose profitable road construction projects?

The research question is elaborated through three sub-questions:

- 1. What aspects are important for choosing profitable road projects?*
- 2. How can risk management become an active process during the early phase, prior to tender?*
- 3. How can risk and opportunities be identified and assessed during the early phases?*



Research Methods

Case study at Road Construction Company in Norway

Structured Interviews

Key people interviewed to understand the main needs for risk and uncertainty identification in the early project phase. 6 people were interviewed:

- Project manager
- Tender manager
- General manager
- Project Cost Estimators (two people)
- Project Development Manager

Survey

Proposed method evaluated through in-company survey with 9 respondents.



Results

Assessing Project Risk

Eleven factors essential in making good project choices:

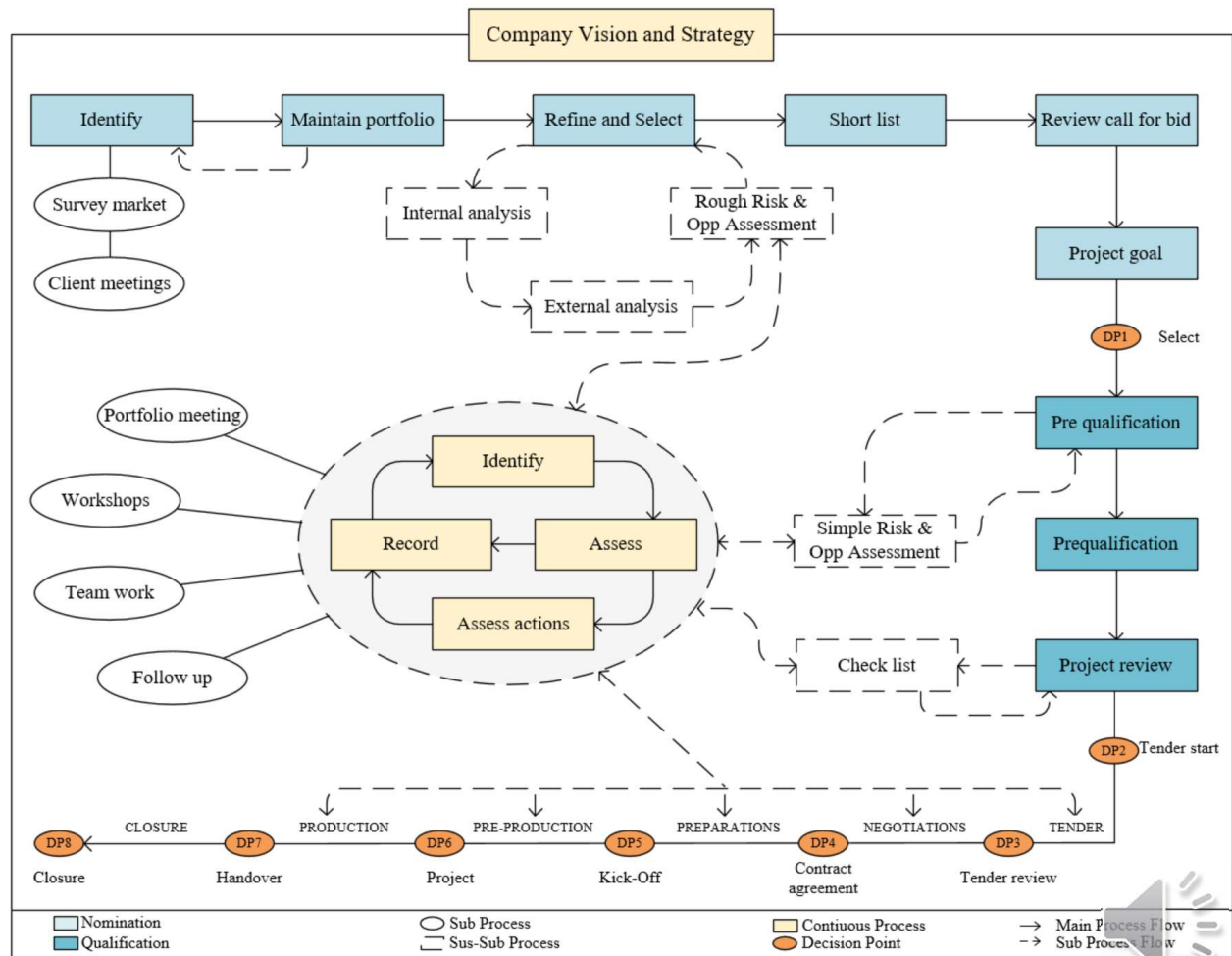
1. *Project timeline*
2. *Contract Type*
3. *Competitiveness*
4. *Affiliation*
5. *Builder*
6. *Geographic location*
7. *Economic condition*
8. *Resources, capacity, size*
9. *Competency*
10. *Project complexity*
11. *Group evaluation*



Results Flow Chart

Flow Chart harmonized with existing in-company process

Risk identification and recording method harmonized with existing project risk method



Results Checklist

2-6 open questions per category:

- Project type
- Location
- Economic constraints
- Resources and Capacity
- Timeframe
- Builder
- Partner companies
- Competitiveness
- Contract type

1. Type prosjekt

- Passer prosjektet til bedriftens mål, verdier og strategi?
- Har vi gjort denne type arbeid tidligere?
- Er det mange nye usikkerhetslementer å ta hensyn til?
- Har vi organisasjonen til å gjennomføre det?
- Har vi kompetansen internt eller må vi hente kompetansen eksternt?
- Hvordan stiller vi oss til prosjektets størrelse/ omfang?

2. Geografisk plassering

- Hvor i landet skal arbeidet utføres?
- Kjenner vi til grunnforholdene i området? Er det nye fjell, leiere, eller jordmasser i området?

3. Økonomiske forhold

- Trenger vi flere oppdrag økonomisk sett?
- Er det mange oppdrag å velge mellom på markedet?
- Har vi råd til å miste det eller kan vi vente til et bedre oppdrag?

4. Ressurser og kapasitet

- Trenger vi oppdrag, kapasitetsmessig?
- Har vi ledig kapasitet?
- Har vi tilgang til de nødvendige ressursene?

5. Tidsløp

- Passer oppdraget i forhold til eksisterende prosjekter?
- Er det mulig å levere prosjektet innen tidsfristen?
- Er det mulig å levere prosjektet før tidsfristen?

6. Byggherre

- Har vi samarbeidet med byggherren tidligere? Fungerte dette bra? Hvis nei, hvorfor ikke? Noen tiltak som kan gjøres for at det skal bli et godt samarbeid?
- Har byggherren et godt eller dårlig rykte for sitt samarbeid?

7. Samarbeidspartnere

- Trenger vi noen samarbeidspartnere?
- Hvilke samarbeidspartnere er rette for prosjektet?

8. Konkurransedyktighet

- Hvilke konkurrenter er interessert i oppdraget?
- Har vi konkurrert med dem tidligere? Hvordan ble isåfall utfallet?
- Har vi sjans til å vinne anbudskonkurransen?
- Hva skal til for at vi skal kunne vinne anbudskonkurransen?

9. Kontraktsform: Totalentreprise


- Påtar vi oss for stort ansvar?
- Påtar vi oss for stor risiko?
- Er det mulig å forhandle ansvars og risikofordelingen?
- Er buffersummen stor nok i forhold til risikoene som må tas?



Results

Risk and Opportunity Register

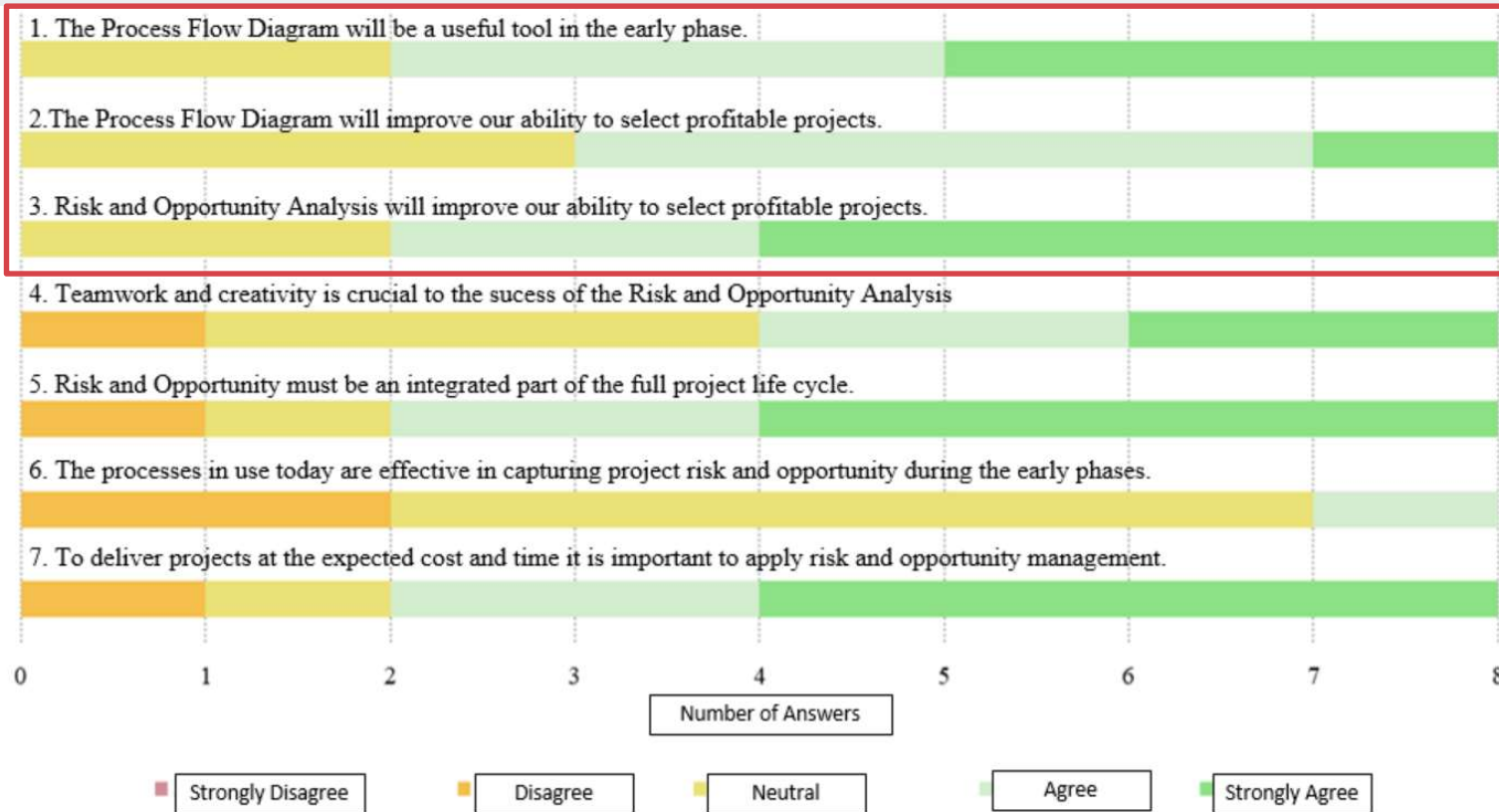
Matrix					Actions (Score)	
Impact	<i>Risk</i>	4				
		3				
		2				
		1				
<i>Opportunity</i>	-1					
	-2					
	-3					
	-4					
		1	2	3	4	
		Probability				



- High Risk, Actions mandatory (11-16)
- Moderate Risk, Actions recommended (7-10)
- Possible risk, Consider actions (4-6)
- Low Risk, No actions needed (1-3)
- Low Opportunity, No actions needed (-1 to -3)
- Possible Opportunity, Actions to be considered (-4 to -6)
- Moderate Opportunity, Actions recommended (-7 to -10)
- High Opportunity, Actions are highly recommended (-11 to -16)



Evaluation



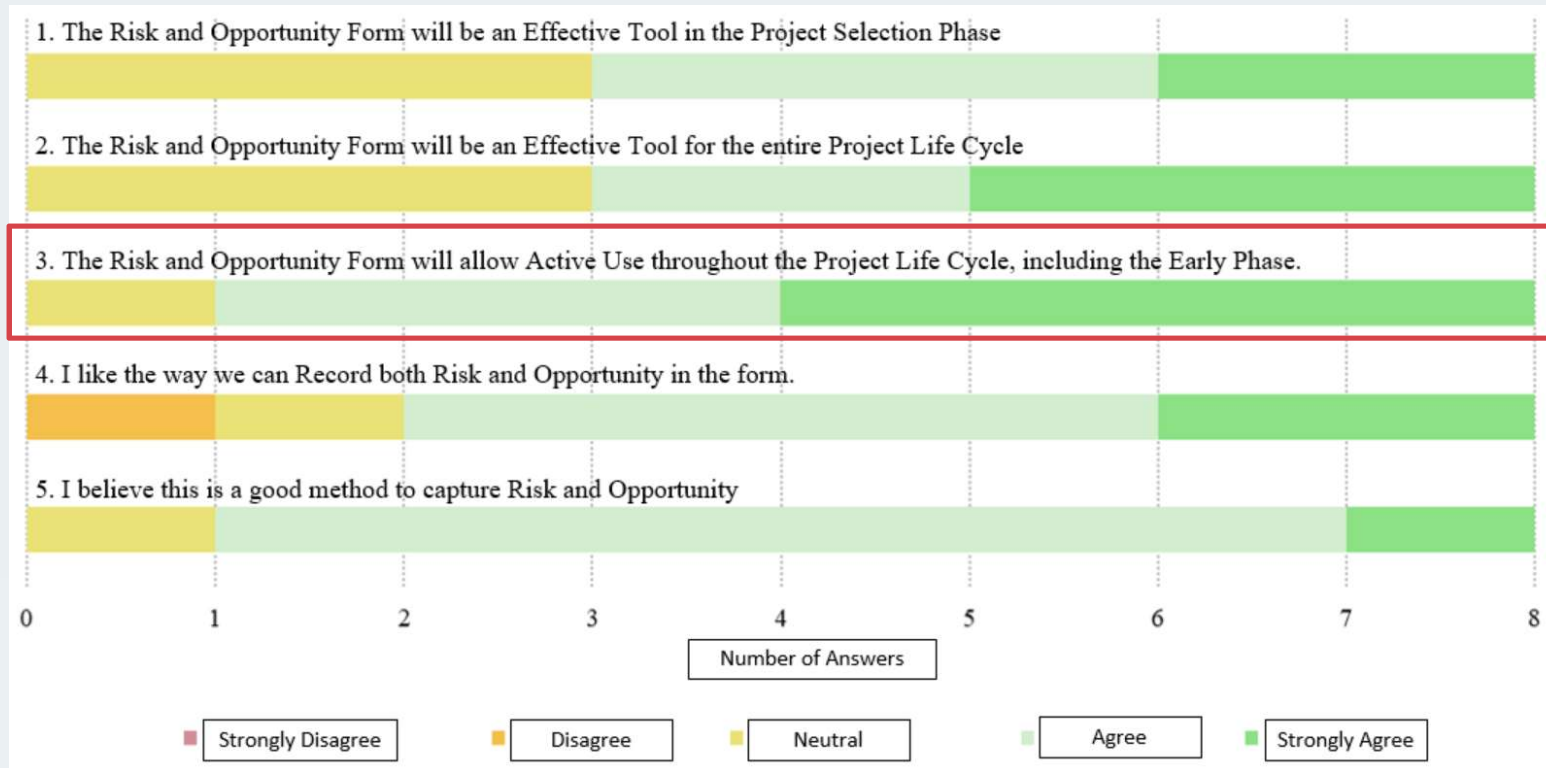
Evaluation – Use of Checklist

The majority of informants believe that a checklist designed with open questions may be more useful than a concrete checklist.

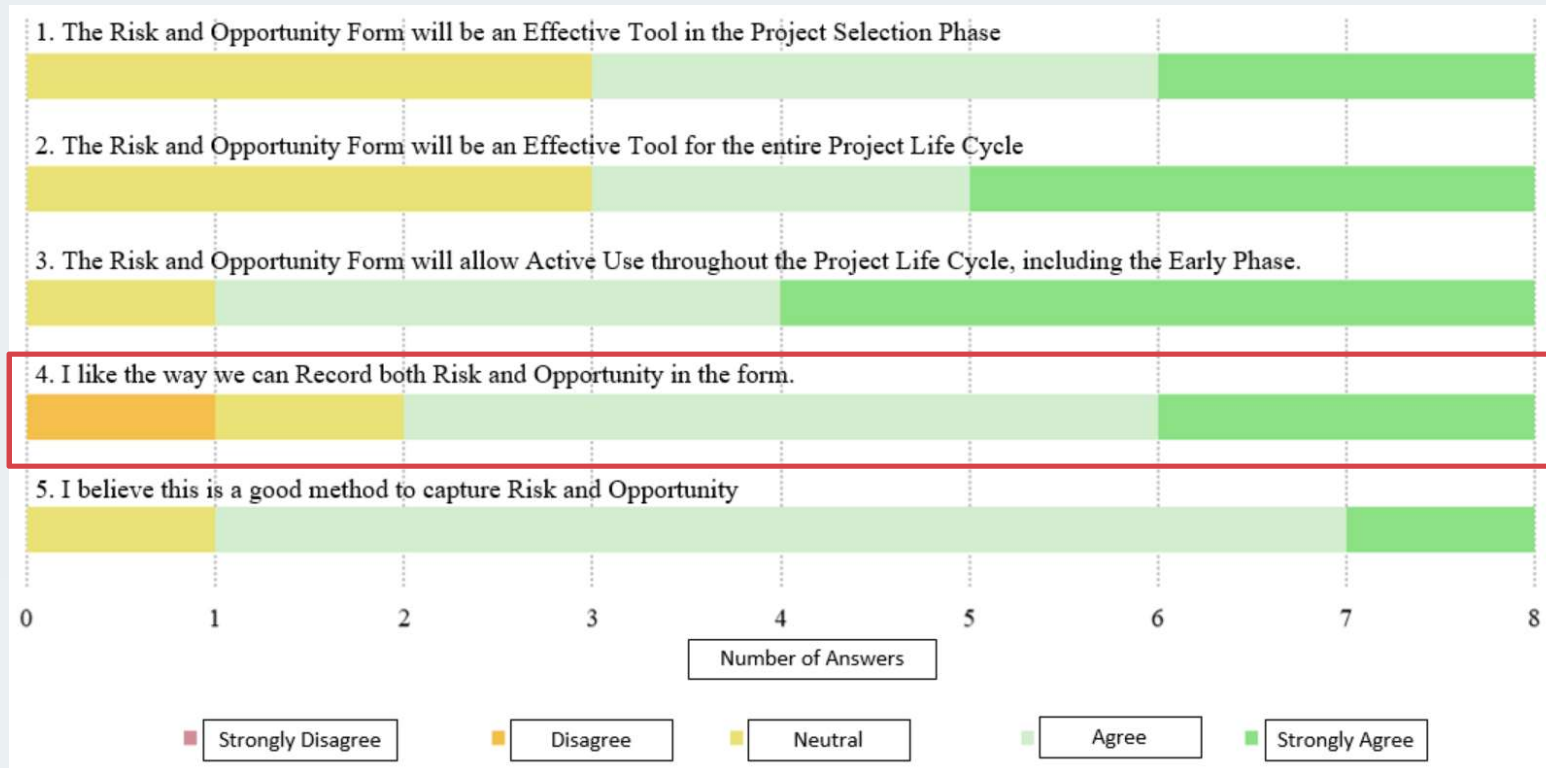
“I thought this was a sensible approach. Our projects are very different and therefore it is natural to have different approaches to the projects.”



Evaluation



Evaluation



Conclusions

Risk and Opportunity assessment prior to the tender phase is one of the most important factors in improving the ability to choose profitable projects.

Pre-established procedures

Using pre-established routines and procedures help create a common understanding of the selection process. This can increase the likelihood of choosing profitable road projects, as well as ensure that decisions for tender preparation have the same basis for each project.

Checklist

Project type, timeframe, competitiveness, partners, expertise and resource access are important factors to consider in order to choose profitable road projects. A checklist help identify the assessment parameters.

Use an risk and opportunity register

This register should be applicable to all project phases, as it is not possible to carry out complete analyzes before the tender preparation starts.



Further Work

Evaluation

- The process flow, the check list, and the uncertainty register should be evaluated in a real project. The aim is to develop a generic methodology that can be used in all projects in the company.

Group process may affect the outcome

- Several researchers claim that group processes in the selection and uncertainty process are a decisive factor in choosing the right projects. All people think differently and possess different knowledge and experience. We recommend to focus on how group processes can improve the quality of the uncertainty analyzes, as well as find out how this can help increase the ability to choose profitable road projects.



Thank you for your attention!

We welcome your questions and comments

Please ask questions using the IS2020 platform,
and the we will respond in writing.





30th Annual **INCOSE**
international symposium

Virtual Event
July 20 - 22, 2020

www.incose.org/symp2020