Self-Introduction and PhD Plan

RAMS seminar

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Content

- Self-Introduction
- Previous work and research experience
- My PhD project

About me…

Name:

Behnaz بهناز

Origins: Iran

Official language: Farsi (Persian)

Capital: Tehran (تهران)

Population ~ 81 millions

Petroleum industry plays
 an important part in Iran.

In 2012, Iran was the second largest

Oil exporter in OPEC.

Abadan Oil Refinery

Where I was born

Where I lived

My University

Caspian Sea

Persian Gulf

Tabriz

Rasht

Kermānshāh

Tehran

Ahvāz

Isfahān

Mashhad

Shīrāz

Zāhedān

Education…

➢ The Petroleum University of Technology (PUT) founded 1939 in Abadan
➢ Leading Iranian public university funded by the Ministry of Petroleum
➢ Second oldest university in Iran after University of Tehran

➢ Master degree in Chemical Engineering (minor:HSE)

Project: Improving the Effectiveness of Risk Management
and Emergency Response Planning for Petroleum Pipelines

➢ Bachelor degree in Safety and Technical Protection Engineering

Project: Gap Analysis of NIOC's HSE Management System

Petroleum University of Technology

Work experience

Industrial internships

➢ NIOC - HSE Headquarters, Tehran (Summer 2009)

- hazard identification and risk management standards ISO 17776 and ISO 31000
- Practical experience in hazard identification techniques (FTA, ETA, What if analysis, JSA) and risk management for offshore platforms

➢ Abadan Oil Refinery, Abadan (Summer 2010)

- Developed practical skills in risk analysis techniques such as HAZOP and FMEA for Onshore process plants
- Contributed to HAZOP study in Catalytic Reformer Unit in Abadan Refinery

National Iranian Oil Company NIOC
شركت ملی نفت ایران

Work experience…


BINA Consulting Engineering Company

- Process safety engineer, Design phase:

Project 1- Crude oil pipeline in southwest of Iran

Project 2- Saveh gas compressor station

- Consequence analysis and quantitative risk assessment
- Engineering design for firefighting water system and hydraulic calculations
- Engineering design of automatic fire protection systems
- Process safety reviews including layout reviews, HAZID, HAZOP and SIL
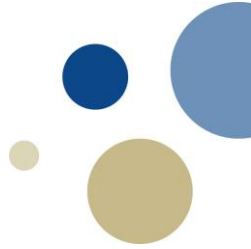- ….
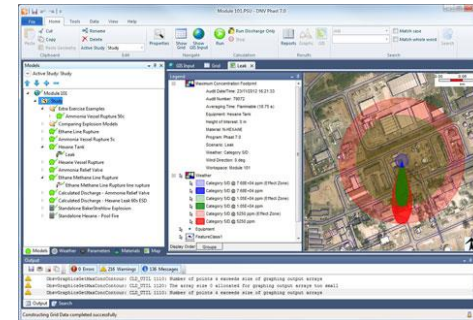
Research experience

➤ **Researcher at Safety and Security Group, TU Delft**

Project:

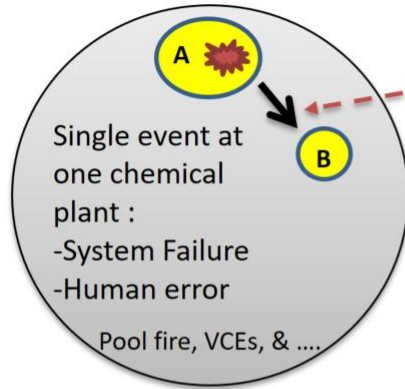**Multi-Plant Emergency Response Planning for Security Threats in Chemical Industrial Areas**

➤ Supervisors: Dr. Nima Khakzad & Prof. Genserik Reniers

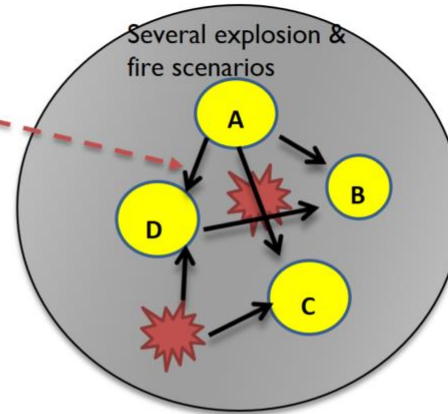➤ Funded project by LDE (Leiden. Delft. Erasmus) Center for Safety and Security
http://www.safety-and-security.nl/research

TU Delft research

Safety Incidents Vs. Terrorist Attacks

Safety event in a chemical cluster

A

B

Single event at one chemical plant :
-System Failure
-Human error

Pool fire, VCEs, & ....

Cascading Effect (Domino)

Terrorist attack (Disaster Situation)

Several explosion & fire scenarios

A

B

D

C

➢ Terrorists deliberately searching for the best manner to execute their plans
➢ Aiming to cause as much damage as possible

How to manage the disaster situation and plan for an effective multi-plant response?!
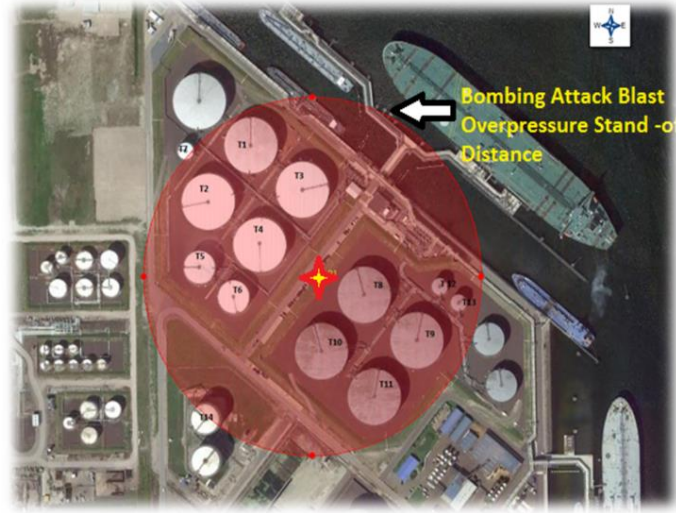
TU Delft research

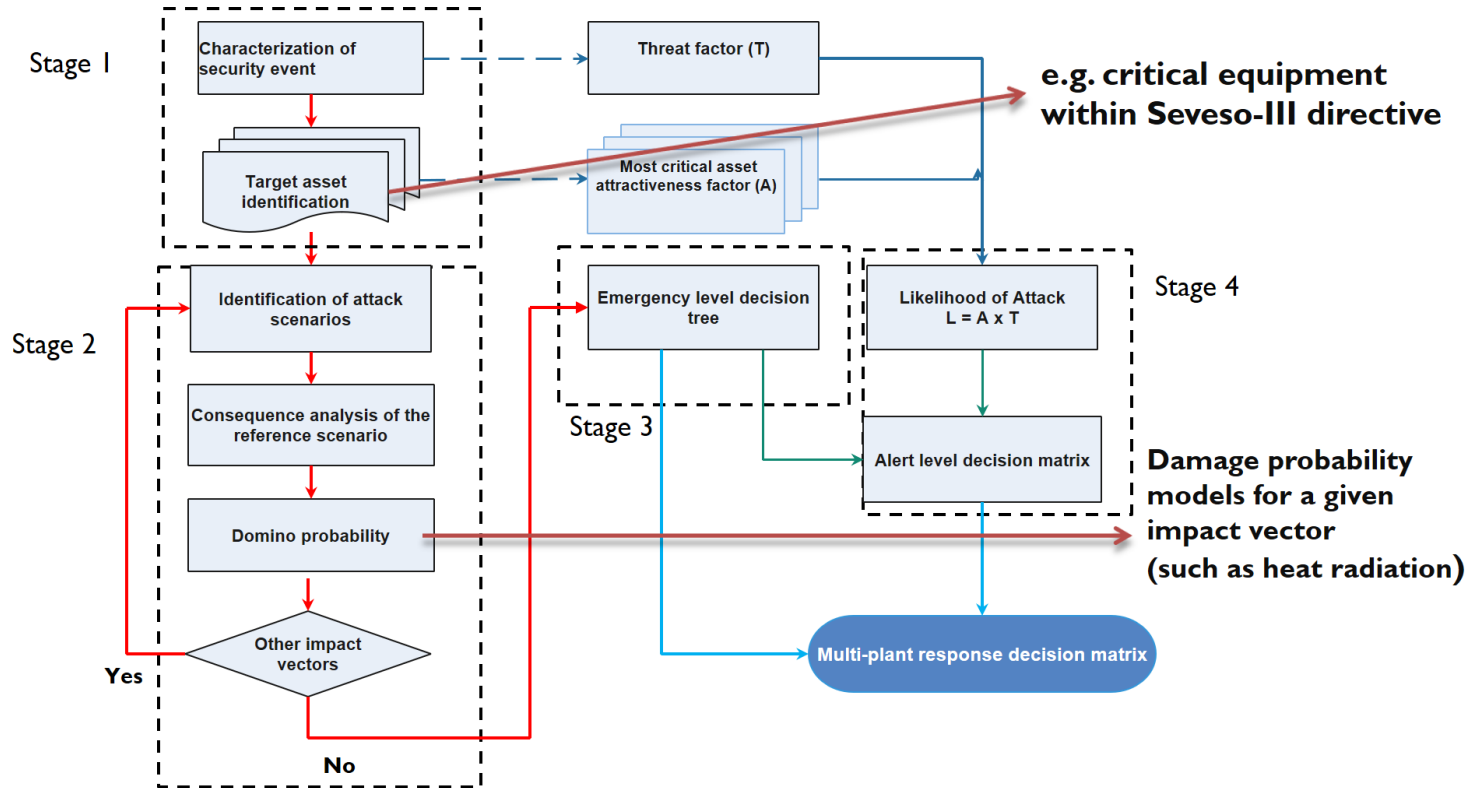> Industrial Case Study (Safety vs. Terrorist)

Safety Event:
Loss of Containment in Ammonia Tank,
Pool fire scenario

Terrorist Attack at a parking lot :
Blast overpressure stand-off distance to
cause damages at storage tanks (200 m)
Secondary scenarios : Pool fires , Toxic
release, Tank fires, Explosions,..

TU Delft research

➢ Methodology Workflow

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> ER Level Determination

Part of the developed decision tree:

> **Each Emergency level:**
> - responsible people,
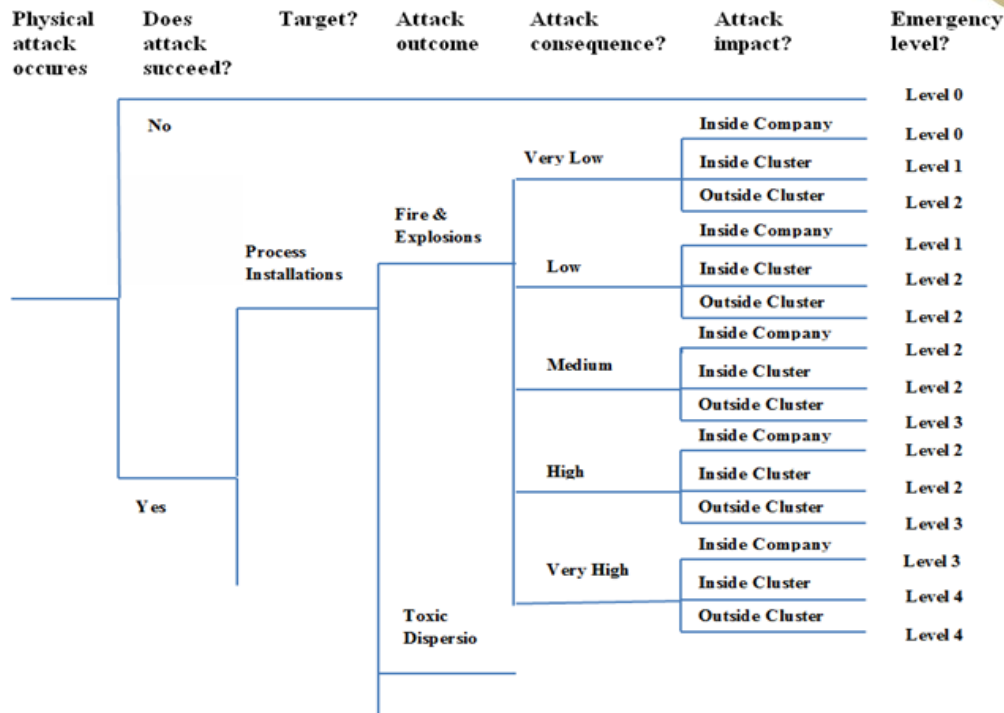> - response strategies,
> - required resources.

Level 0: Informative alert
Level 1: Pre- alarm
Level 2: Alarm
Level 3: High alarm
Level 4: High-high alarm

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> ## Alert Level Determination

ER Level	Likelihood of Attack				
	1	2	3	4	5
0	Alert Level 0	Alert Level 1	Alert Level 1	Alert Level 2	Alert Level 2
1	Alert Level 1	Alert Level 1	Alert Level 2	Alert Level 2	Alert Level 3
2	Alert Level 1	Alert Level 2	Alert Level 2	Alert Level 3	Alert Level 3
3	Alert Level 2	Alert Level 2	Alert Level 3	Alert Level 3	Alert Level 4
4	Alert Level 2	Alert Level 3	Alert Level 3	Alert Level 4	Alert Level 4

Level	Description
Low	Normal security operations,
Guarded	Heightened awareness, increase vigilance, Patrol critical areas,… Coordinate with cluster security…
Elevated	Increasing security measures, Coordinate with local police, Execute contingency procedures,
High	Plant evacuation, National Crisis team/ local government
Severe	Expand surveillance & mobilizing trained personnel ,… National Crisis team

API 780 (2012):

Attack Likelihood (L)= A x T

Attractiveness factor   Threat factor
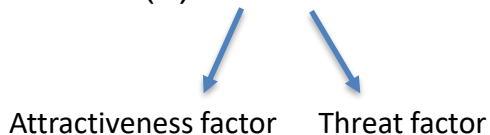
Ranking	Descriptor	Likelihood of attach
1	Very low	$0.0 \leq L \leq 0.2$
2	Low	$0.2 < L \leq 0.4$
3	Medium	$0.4 < L \leq 0.6$
4	High	$0.6 < L \leq 0.8$
5	Very High	$0.8 < L \leq 1.0$

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➤ Multi-plant decision matrix

ER: Emergency response level,

A: Alert level

	Company 1		Company 2		Company 3		Company 4		Company 5	
	ER	A	ER	A	ER	A	ER	A	ER	A
Scenario 1 (VBIED at AP1)	2	3	3	4	4	4	1	1	2	2
Scenario 2 (Suitcase bomb at AP2 and AP3)	4	4	4	4	3	2	3	1	0	3
Scenario 3 Suicide Boat at Dock 1	2	3	3	3	4	4	1	3	0	1
Scenario 4 ….										

TU Delft research

➢ Publications:

- Hosseinnia, B., Khakzad, N. and Reniers, G., 2018. Multi-plant emergency response for tackling major accidents in chemical industrial areas. Safety Science, 102, pp.275-289.

- Hosseinnia, B., Khakzad, N. and Reniers, G., 2018. An emergency response decision matrix against terrorist attacks with improvised device in chemical clusters. International Journal of Safety and Security Engineering, 8(2), pp.187-199. Presented at the 7th International Conference of Safety and Security Engineering (SAFE) 2017, Rome, Italy.

- Hosseinnia, B., Khakzad, N., Reniers, G., 2017 A Multi-Plant Emergency Response Matrix for Tackling Major Fire Accidents in Chemical Clusters. European Safety and Reliability Conference (ESREL) 2017, Protozoa, Slovenia (published in the conference proceedings)

NTNU
Norwegian University of
Science and Technology

My PhD project

Project: Risk Analysis for Industry 4.0.

Supervisor: Nicola Paltrinieri

Co-supervisor: Pierluigi Salvo Rossi (Kongsberg Energy)

Co-supervisor: Genserik Reniers (TU Delft, The Netherlands)

Main Objective:

- To address exploiting data fusion and machine learning for real-time risk evaluation

- Providing a unifying framework for Dynamic Risk Analysis in industry 4.0.

My PhD project

➢ Work plan

1st year	2nd year	3rd year
✓ Course work ✓ Detailed literature review ✓ Identifying the problem ✓ Research questions	✓ Developing a new model ✓ New methods that updates the current DRA models for next generation of industry	✓ Data analysis ✓ Validation of the developed models ✓ PhD thesis !
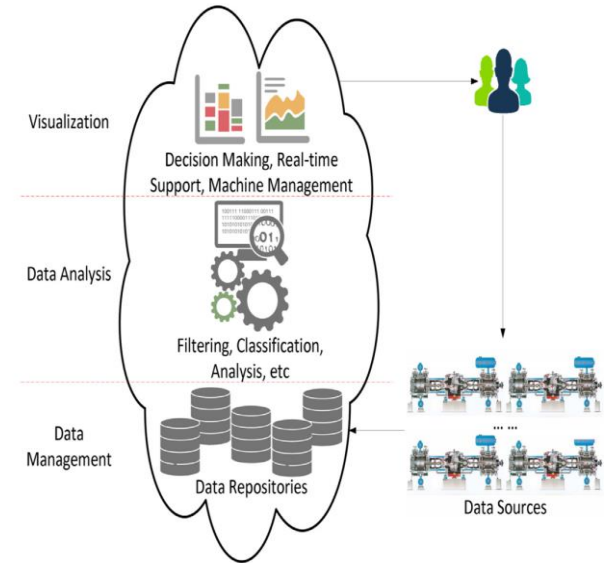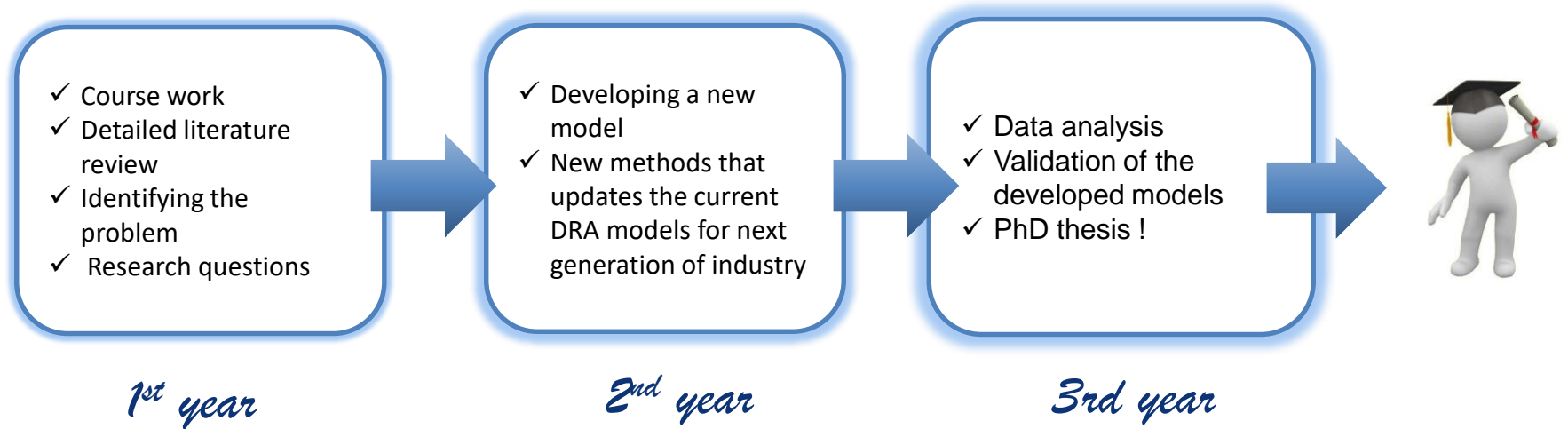
My PhD Project

- Expected outcome (hopefully!)

Artificial Intelligence

Indicators (input)

Barrier elements

Barrier systems

Barrier functions

Risk Picture (output)

Human risk

Environ. risk

Training
In order to learn how to assess risk, the model will train on the basis of past mishaps, near misses, incidents and accidents from a number of databases, assisted by selected experts.

Risk assessment
The instantaneous state of the plant will be provided to the model through indicator values. Such state will be analysed by each layer in order to assess the related risk.

Layers
Each layer will assess increasingly complex (and abstract) functional aspects of the plant. Intermediate layers can be accessed to enable drill-down capabilities and semi-supervision by the user.

Risk Picture
The risk picture is evaluated on the basis of consolidate methods for risk assessment, lessons learned from past events and expert judgement. The more the model is trained, the more the result will converge to expert judgment. Strength of knowledge will be expressed by the level of training given to the model and the number of simulated inputs.

User

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Thank You!