

Korea Petrochemical Industry Association

Enterprise Risk Management Services

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9 November 2011



The Clean Technology Centre in Singapore is a hub providing DNV's wider service offerings to the Asia Pacific region



Korea Petrochemical Industry Association

Maritime industry

Banks and financial institutions

Oil and gas industry

Renewable energy industry

Power generation & transmission

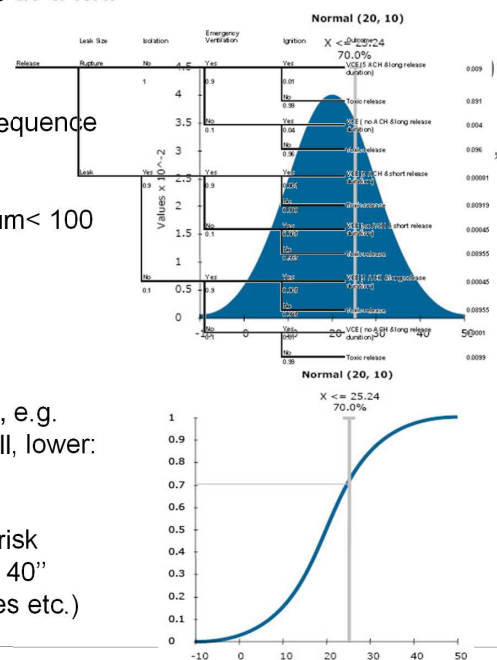
Governments, international
institutions and R&D organisations

Enterprise Risk Management aims to support clients at their point of need – it is always tailored to the client's requirements



Balancing tools and ambition level

- **Level 0:** General evaluation of risk. Commonly done as a text report (not always considered risk management)
- **Level 1:** Single risks identified, probability and consequence ranked as e.g. low/medium/high
- **Level 2:** Levels quantified, e.g. "low < 10 Mill, medium < 100 Mill, high > 100 Mill
- **Level 3:** Each risk quantified, e.g. probability 12%, consequence 40 Mill
- **Level 4:** Distribution of probability and consequence, e.g. consequence triangular distribution, expected: 25 Mill, lower: 17 Mill, and upper: 40 Mill
- **Level 5:** Modelling of relations between risks (if this risk occurs, the next risk is 35% more likely to occur with 40" higher consequence) (Scenario modelling, event trees etc.)



COST & SCHEDULE RISK ANALYSIS

- ✓ Why do companies perform a cost & schedule risk analysis?
- ✓ What is a cost & schedule risk analysis?
- ✓ How do companies perform a cost & schedule risk analysis?

Why do companies perform a cost and schedule risk analysis?

Companies dealing with complex projects...



...require enhanced decision-making processes in the face of uncertainty

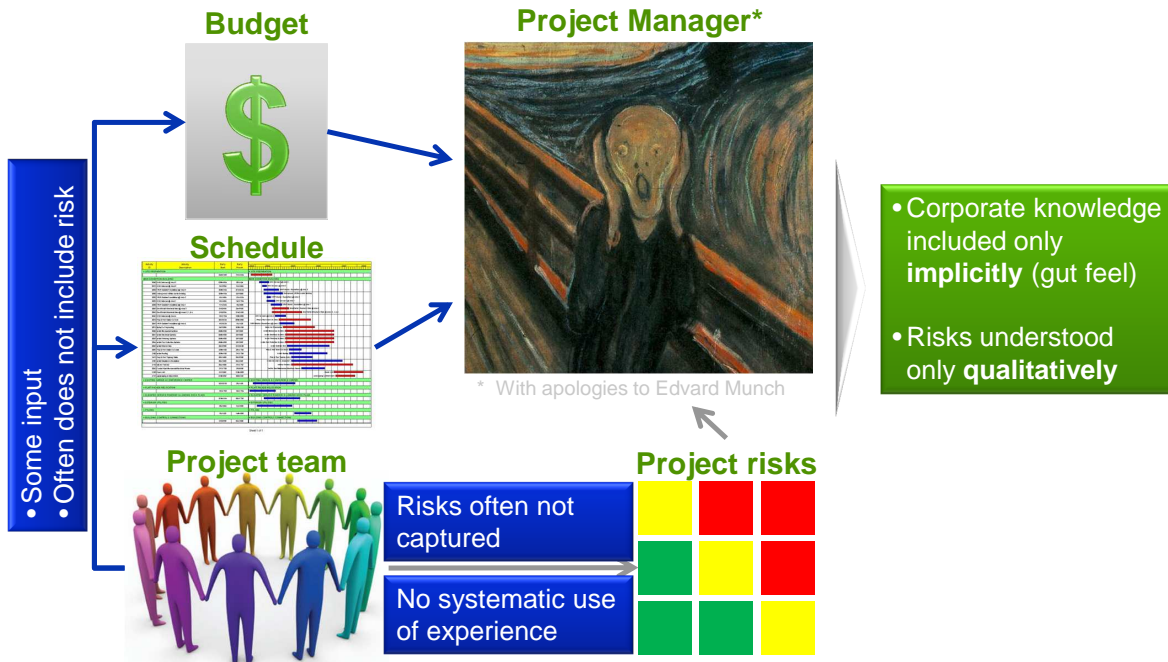
- **Improved communication.**
- Internal and external.
- All relevant corporate knowledge captured and included into decisions.

- **Better concept selection.**
- Risk lens explicitly included into different concepts
- Part of larger strategic decisions

- **Risk management.**
- Quantitative estimates of key risks
- Impact on cost
- Impact on schedule
- Optimise risk-reward

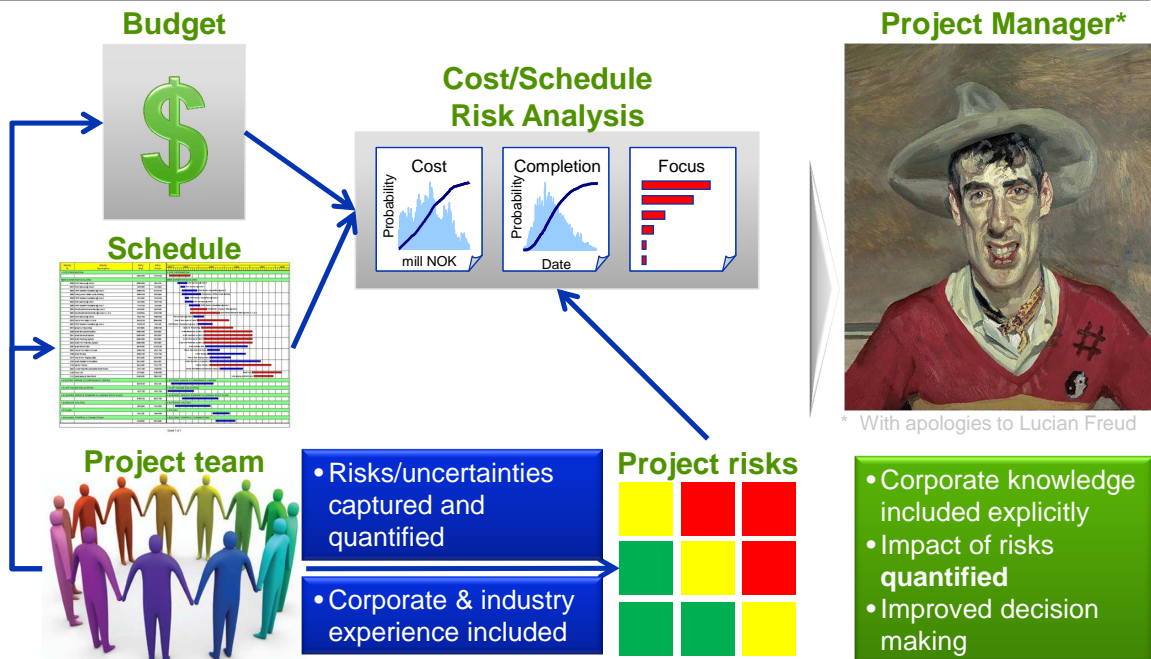
Why do companies perform a cost and schedule risk analysis?

Common current situation



Why do companies perform a cost and schedule risk analysis?

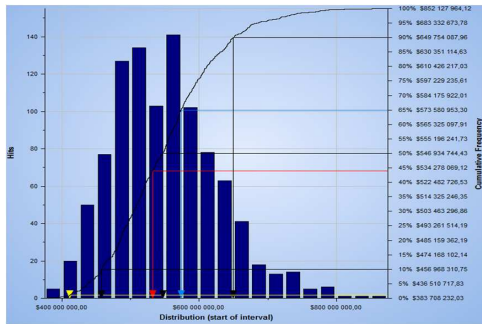
Cost & Schedule Risk Analysis



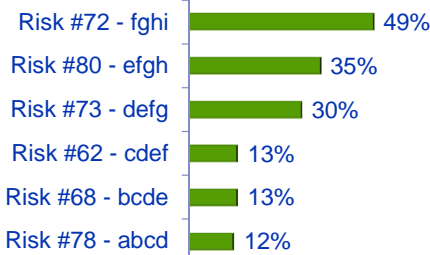
What does a cost and schedule risk analysis look like?

Example from upstream gas project

Example of a pre-mitigated cost curve



Corresponding risk tornado



- Generate cost curves for key components of the project or for the overall project

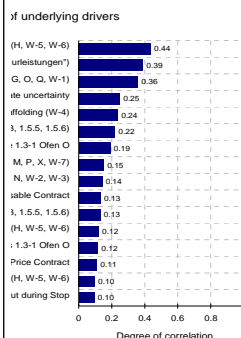
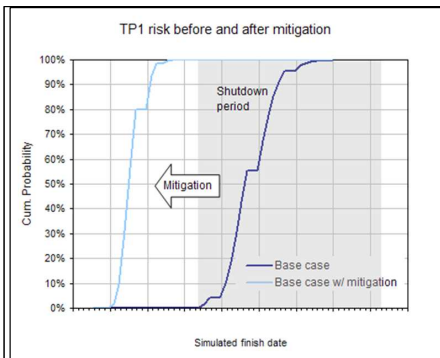
Answers key questions:

- ✓ What is the probability that the costs will exceed the contingency?
- ✓ What is the most likely cost?
- ✓ What is the maximum likely exposure?
- ✓ What are the key risk drivers for the costs?
- ✓ What is the probability of a negative NPV?
- ✓ How do the curves of two concepts compare?
- ✓ Where should by risk control efforts be focused

What does a cost and schedule risk analysis look like?

Example from TMC project in OMV Burghausen

- OMV initiated TMC project to increase the production capacity of propylene & ethylene
- The project was highly complex:
 - 7 subproject
 - Compressed schedule
 - High priority on completion dates
- OMV Board of Directors asked DNV to perform a Cost & Schedule Risk Analysis



- High risk of budget & schedule overrun
- Critical underlying risk drivers were identified
- Additional contingencies were added
- Critical path activities were identified: week-end work for these reduced risk of delay

What does a cost and schedule risk analysis look like?

Overview of key results

Typical cost & schedule risk analysis includes:

- Cost or value probability **curve** and **drivers**
 - Quantified cost uncertainty (\pm \$\$\$) associated with project or phase
 - Clear understanding of the risks that most impact the costs
- Schedule **curve** and **drivers**
 - Quantified schedule uncertainty (\pm days) associated with project or phase
 - Clear understanding of risks that most impact the schedule
- Correlation **scattergram** between cost and schedule
 - Visual understanding of cost and schedule correlations
 - Enables scenario planning according to small number of key uncertainties
- Evaluation of improvement opportunities
- Appendices and details vary by project according to requirements/details

How do companies perform a cost and schedule risk analysis?

Workshops & interviews to gather institutional knowledge

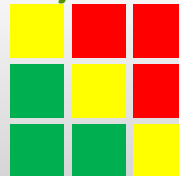


- Project documents
- Workshops
- Interviews
- Previous experience



- Risk register

Project risks



- Estimation of likelihood of each risk
- Estimation of specific impact of each risk

“This is the first time that all disciplines were able to discuss the risks facing the project openly and sanely in the same room”

– Client project sponsor

How do companies perform a cost and schedule risk analysis?

Analysis technique includes dependencies, float etc




Cost & schedule

Activities	Cost	Time
Activity AAA	XXX	TTT
Activity BBB	YYY	UUU
Activity CCC	ZZZ	VVV
...

Risk register

Risks	Likelihood	Impact
Risk 1	--%	Activity AAA
Risk 2	--%	Activity BBB
Risk 3	--%	Activity CCC
...

Market drivers & uncertainties & Correlations

Driver	Unit value	Distribution	Correlations
Steel	SSS		Labour, Day rates
Labour	LLL		Steel, Day rates
Day rates	DDD		Steel, Labour,...
...

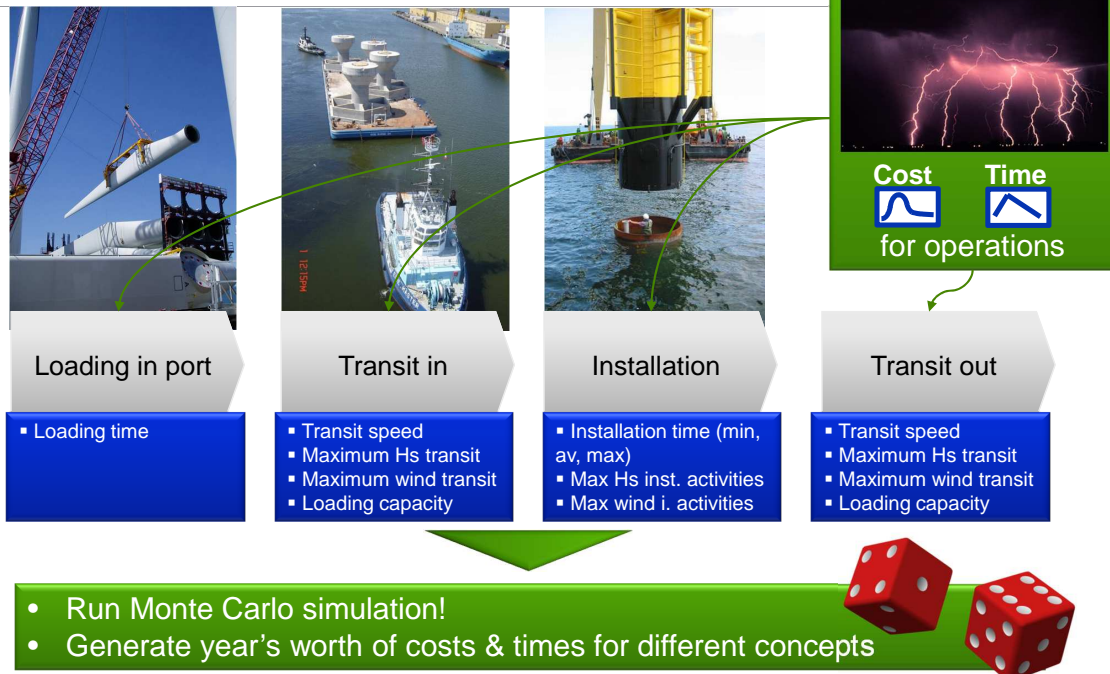
- Run Monte Carlo simulation!



- Collect and iterate according to conclusions
- Write-up report

How do companies perform a cost and schedule risk analysis?

Analysis technique for logistics/supply chain (DES)



Conclusion

- Cost and schedule risk analysis is used routinely on complex projects
- It is an approach that DNV has used widely, eg in the off-shore wind industry
 - We have also adapted the approach to include off-shore installation concepts
- It can be used for concept selection, due diligence or enhanced project management

“Often I tend to ignore items that are outside of my control. This report gives me the ability to communicate risks that need to be managed by the wider organisation, by emphasising which risks to communicate and what the impact of those risks will be if left unmitigated” - Client project manager



EASY RISK MANAGER

- ✓ Why do companies use Easy Risk Manager?
- ✓ What is Easy Risk Manager?
- ✓ How do companies use Easy Risk Manager?

DNV & Software?



DNV is not primarily a software producer



DNV's core competence is to identify, assess, and advise on how to manage risk

Companies that deal in complexity often need a system for managing their risks across the organisation

Geographically spread out



Lack of standard methods



Lack of awareness



Technological complexity



- What are the risks facing your organisation, division, project...?
- Who is responsible for them?
- What activities are linked to them?
- What reports are routinely published about them?


EasyRisk Manager

Selected EasyRisk Manager users



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MANAGING RISK

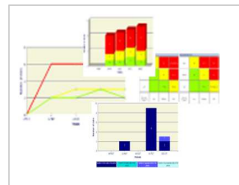
Features of in EasyRisk Manager™



Web Risk Database



Efficient way to communicate risks



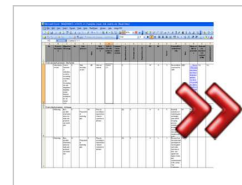
Risk Statistics



Track of your Actions



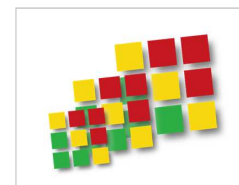
Easily managed



Import risks and actions



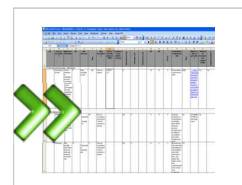
Safe and secure hosting



Flexible licensing



Reports



Export risks and actions

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MANAGING RISK

With EasyRisk Manager you get

- A Web Risk Database

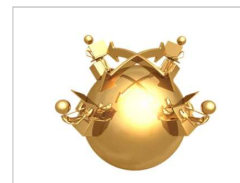
- Share your risk data with others
- No installation on clients, use a standard web browser
- Highly customisable



Web Risk Database

- An efficient way to communicate the risks throughout the organisation

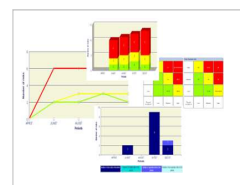
- Show risks in matrices (any size) , concentrate on the important ones
- Show risks in lists ordered by criticality, status, owner, organisation etc.
- Show Hot Spot list (most important risk just now)
- Categorise Risk and Actions



Efficient way to communicate risks

- Risk Statistics

- Show criticality per organisation
- Criticality over time
- Monitor the effectiveness of risk mitigation



Risk Statistics

With EasyRisk Manager you get

- Track of your Actions

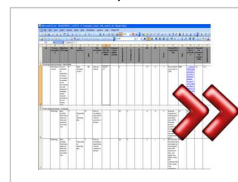
- Follow up of the risk mitigation plan
- Watch risks and associated actions
- Email notifications to owners and other responsible for risk and actions



Track of your Actions

- Import risks and actions

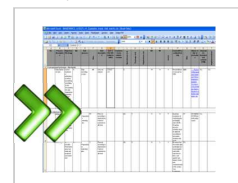
- Risks and Actions may be imported from Excel
- Input your workshop details into the register



Import risks and actions

- Export risks and actions

- For your reports you may export risk and actions to Microsoft Word and Excel
- Export data to be used in quantitative tools

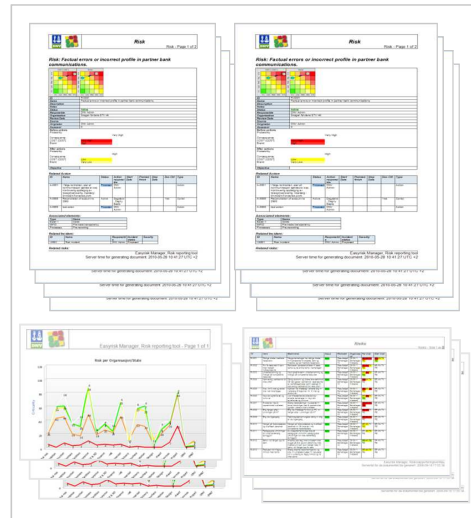


Export risks and actions

With EasyRisk Manager you get

■ Reports

- Create reports to match your needs
- Define different reports for different roles
- Automatically include company logos
- Keep track of most relevant risks through hot spot reports for each part of the organisation
- Export reports to Microsoft Excel and Word



Reports

With EasyRisk Manager you get

■ Safe hosting

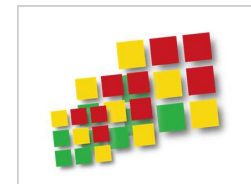
- DNV can host your database
- Access on an encrypted line
- Move to your own intranet later



Safe and secure hosting

■ Flexible licensing

- Pay as you grow (in terms of functionality, risks, actions, and login id's)
- Microsoft Access, Microsoft SQL Server or MySQL databases



Flexible licensing

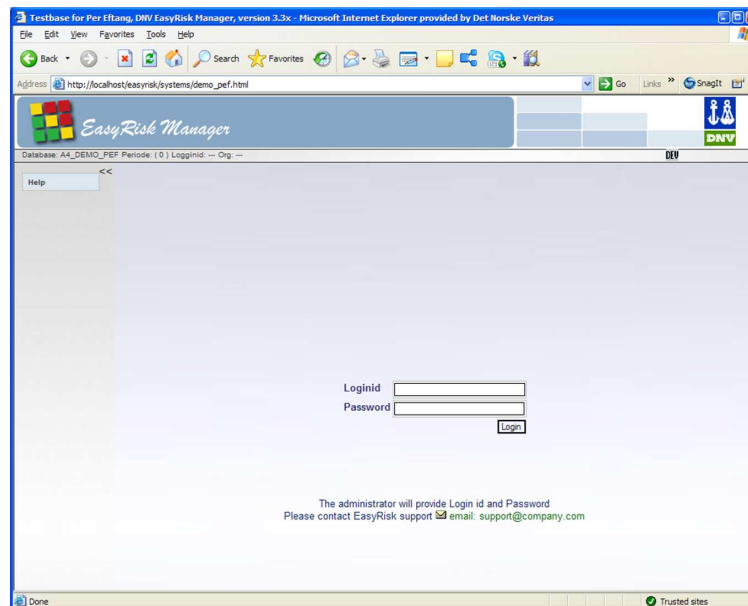
■ Easily managed

- Define roles and control access to the register
- Single sign-on on Microsoft intranets
- Full history and traceability of risks and actions and other changes to the database



Easily managed

Login to EasyRisk Manager



Dash board front page (automatically adapted to the user)

Decide in what Context you want to work

Select different risk reports and views

Search risk register for risks/ actions or incidents containing your search criteria

Add risks and incidents (simplified or detailed view)

Automatic view of your most relevant risks/ Actions/ Incidents (e.g by review date)

Risk Matrix for selected Context

Registered information about you

Context: [Show all]

My Risks My Actions My Incidents

Search result...

My most urgent items:

ID#	Name#	Description#	Status#	Risk responsible#	Organisation#	Review Date#	Before actions†	After actions†	Treatment strategy#
R-0001	Delay in SPS qualification	A number of new technologies need to be qual...	Taken	Christian Aasberg	SPS Contractor	2011-02-26	COST SCHE PERF	COST SCHE PERF	Take
R-0002	SPS test delays	The different tests of the SPS system (including L...	In progress	Christian Aasberg	SPS Contractor	2011-02-26	COST SCHE PERF	COST SCHE PERF	Treat
R-0003	Insufficient SPS maintenance organisation in West Africa	The SPS supplier has presently (=1.04.2004) only a...	In progress	Christian Aasberg	SPS Contractor	2011-02-26	COST SCHE PERF	COST SCHE PERF	Treat
R-0004	Damage to SPS parts during loading in West Africa	SPS parts are damaged during loading in Africa. Su...	In progress	Christian Aasberg	SPS Contractor	2011-02-26	COST SCHE PERF	COST SCHE PERF	Treat
R-0005	Insufficient adaptation of SPS control system to large water depths	The SPS control system has so far only been used &...	Active	Christian Aasberg	SPS Contractor	2011-02-26	COST SCHE PERF	COST SCHE PERF	Treat
R-0006	Insufficient capacity of SPS Contractor to comply with schedule	The SPS Contractor has a number of large projects ...	In progress	Christian Aasberg	SPS Contractor	2011-02-26	COST SCHE PERF	COST SCHE PERF	Treat

Showing 10 most relevant, Show all mine

Risk Matrix:


2	17	24	9
4	7	8	25
31	9	3	6
14	10	15	28
11	12	10	29

ID: 9
Name: Christian Aasberg
Description: SPS Contractor
Email: emailtestrisk@gmail.com
Tel: +47 67579900
Mobile:
Fax:
Risk: 
Action: 
Incident: +

The screenshot displays the EasyRisk Manager software interface, which is used for managing risks. The interface is divided into several sections:

- Risk list edit mode:** This is the main view showing a table of risks. The table has columns for ID, Name, Description, Notes, Status, Responsible, Organisation, Review Date, Before actions, and After actions. The risks are listed in a table with alternating blue and white rows. A green callout points to this section.
- Detail view:** This view shows the details of a specific risk. It includes a risk matrix (a 3x3 grid of colored squares) and a list of risk factors. A green callout points to this section.
- Detail edit mode:** This view allows editing the details of a specific risk. It includes a risk matrix (a 3x3 grid of colored squares) and a list of risk factors. A green callout points to this section.

The interface also includes a sidebar with navigation options such as "Open actions", "Open incidents", "Risk list", "All risks & add", "All risks", "All actions", "All actions with risks", and "ISMS".



EasyRisk Manager

Database: A4_DEMO_PEF Period (10) LoginID Administrator Org Administration
 🇬🇧

Frontpage

Targets

Open risks

Open actions

Open incidents

Hotspot

Risks to risks

All risks & act.

All risks

All actions

All actions with risks

Ordered lists

Per organisation

Matrix

Open

Active

Targets

Total target [TOT]
 Economy [ECON]
 Time [TIME]
 Performance [PERF]
 Availability

States

Potential risk
 Residual risk

Zoom

100

Show vertically

☐

Show

☐ Count risks only

☐ W

Total, Potential risk					Total, Residual risk				
High	31 61	14 22 25	16 33 35 42 62 63 65	High	25	22	33 42 62 63 65		
Medium		18 20 26 34 37	1 2 8 19 36 40 41 64	Medium	31 37 61	1 16 26 34	35 8 41 64		
Low	4 5 7 11 12 15 17 23 32 38 39 50 51 52 53 54 55 56 57 58 59 60	10 21 24 27 28 29	3 6 9 13 30	Low	4 11 12 20 23 27 36 38 39 40 5 7 15 17 32 50 51 52 53 54 55 56 57 58 59 60	2 10 13 14 16 18 21 24 28 29	3 6 9 30		
↑ Prob ↓ ← Cons →	Low	Medium	High	↑ Prob ↓ ← Cons →	Low	Medium	High		

Select targets to view risk matrix

Click Risk number to view risk details

Overview of Risks with related Actions

EasyRisk Manager

Database: AK_DEMO_PEF Period: 10 LoginID: Administrator Org: Administration

Frontpage Add Reports Open risks and actions Open risks Open actions Open incidents Hotspot Risks to risks All risks and act. All risks All actions All actions with risks Ordered lists Per organisation Matrix Selection Statistics Custom reports Setup Admin Help Logout

Risks with associated actions Matrix wo/Actions

Page 1 by 2 Refresh Filter: Status=all

Id#	Id#	Name	Status	Personnel	Organisation	Start Date	Planned finish	Stop Date	Before action Due	After action
R-0001	A-0001	Customer A will not extend their contract regarding operating UNIX	Active	Rolf Lervik	ICT	1/1-2007	5/2-2007			ECON TIME PER
	A-0002	Estimate customers costs for changing supplier	Rejected	Robert Robertsen	Administration	1/1-2006		1/3-2006		
	A-0003	Calculating exact income loss if Customer A doesn't prolong the contract	Rejected	Robert Robertsen	Administration	1/1-2006		1/3-2006		
	A-0004	Meet CEO in Customer A	In progress	Jenny Hansen	Administration	3/1-2007	15/1-2007	17/1-2007		
	A-0005	Work out emergency preparedness plan to handle the situation if Customer A doesn't prolong the contract	Closed	0	0	1/1-2006		1/1-2006		
R-0002	A-0006	Top expertise is leaving the project	Active	Jenny Hansen	Administration	26/1-2007				ECON TIME PER
	A-0007	Establish activity to strengthen our working environment	Closed	Bjorn Bjergsen	Administration	1/3-2006		1/5-2007		
	A-0008	Project Working environment- audit	Closed	Bjorn Bjergsen	Administration	1/3-2006		1/7-2007		
	A-0009	Implement an incentive scheme for payment	Proposed	Per Personal	Administration	3/1-2007		1/2-2007		
R-0003	A-0010	Not enough capacity in existing equipment to serve a new version of system C	Active	Bjorn Bjergsen	Production line 1					ECON TIME PER
	A-0011	Upgrade hardware	Proposed	John Johnsen	Administration	1/1-2007		1/1-2003		
R-0004	A-0012	Upgrading to Oracle 9 will result in problems for system A	Active	Jenny Hansen	Development					ECON TIME PER
	A-0013	Testing upgrading of testsystem and simulate realistic load conditions	Closed	Bjorn Bjergsen	Administration	1/2-2006		25/2-2006		
	A-0014	Contact Oracle experts	Closed	Bjorn Bjergsen	Administration	1/2-2006		10/2-2006		
	A-0015	Prepare fail-back solution in front of the upgrade	Closed	Bjorn Bjergsen	Administration	1/2-2006		1/3-2006		
R-0005	A-0016	Merger of Customer B and Customer C	Closed	Ole Olsen PM	Production line 1					ECON TIME PER
R-0006	A-0017	Foreign company acquisition of customer D => Loss of sale	Active	John Johnsen	Development					ECON TIME PER
	A-0018	Offer services to the buyer	In progress	0	0	1/4-2006		30/9-2006		
R-0007	A-0019	Customer F is threatening with terminating their application contract	Closed	Ole Olsen PM	Production line 1					ECON TIME PER
R-0008	A-0020	The installation of a new firewall might result in network problems	Proposed	Bjorn Bjergsen	Administration					ECON TIME PER
	A-0021	Improve routines and testing of installations of new equipment in network	In progress	Bjorn Bjergsen	Administration	1/1-2006		1/5-2006		
R-0009	A-0022	Focus on organisation, not enough on processes	Closed	John Johnsen	Administration					ECON TIME PER
	A-0023	Adjust the process specifications	Closed	Generak	QA	1/1-2007	23/9-2007	1/1-2003		
R-0010	A-0024	The supplier of economy systems moves to Denmark!	Proposed	Alte Andersen	Administration					ECON TIME PER
	A-0025	Carry out Danish lessons for all employees	Rejected	Generak	QA	1/1-2007		1/2-2003		

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MANAGING RISK DNV

Export and import to Word & Excel

Select your report content

Export to Word or Excel

Example report in Excel

EasyRisk Manager

Database: AK_DEMO_PEF Period: 10 LoginID: Administrator Org: Administration

Frontpage Add Reports Open risks and actions Open risks Open actions Open incidents Hotspot Risks to risks All risks and act. All risks All actions All actions with risks Ordered lists Per organisation Matrix Selection Statistics Custom reports Setup Admin Help Logout

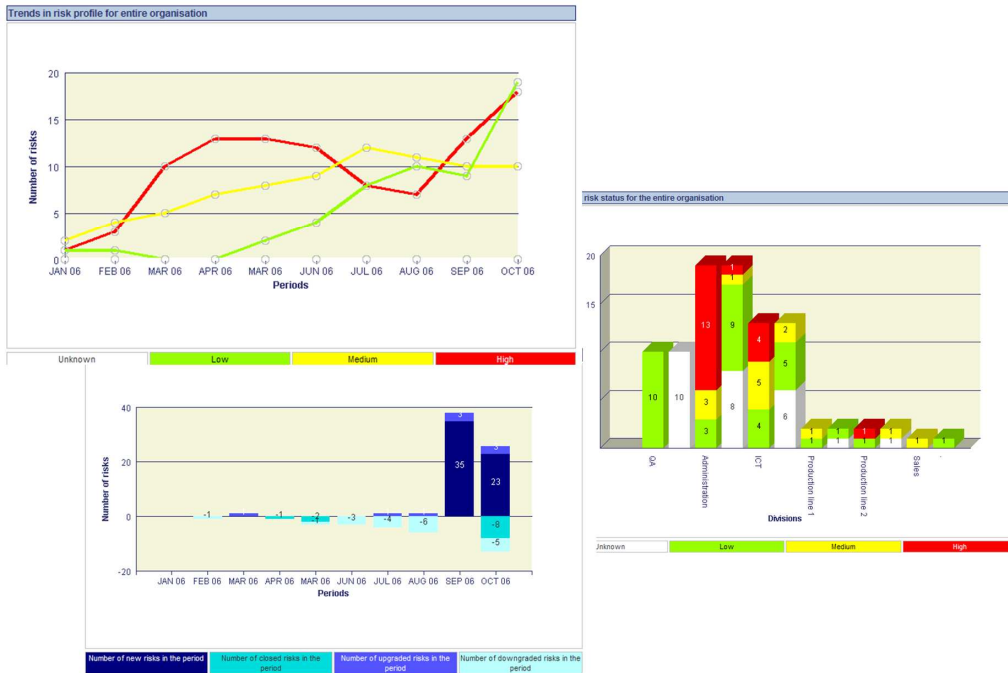
Export Word List Word Details Word All

Microsoft Excel - navn200909291740131.xls

ID	Name	Description	Notes	Status	Personnel	Organisation	Start Date	Planned finish	Stop Date	Before action Due	After action
R-0002	Letter in en viking	Some of our competitors are very aggressive in hunting and they offer high salary and the ones with all the critical knowhow	This is very critical since these people are leaving our key-developer. They offer high salary and the ones with all the critical knowhow	Active	Rolf Lervik	ICT	1/1-2007	5/2-2007			ECON TIME PER
R-0003	Not enough capacity in existing equipment to serve a new version of system C	The new version of system C holds some new functions which would be to serve the existing system. We do not know how serious this is present day.	A solution has been found (see action)	Active	Bjorn Bjergsen	Production line 1					ECON TIME PER
R-0004	Upgrading to Oracle 9 will result in problems for system A	The upgrade to Oracle 9 two years ago resulted in serious problems for another project in these one reason not to believe that these upgrade will lead to similar problems?	The Oracle 9 upgrade was successful. Risk closed 15.3.2002.	Active	Jenny Hansen	Development					ECON TIME PER
R-0010	The supplier of economy systems moves to Denmark!	We have just been informed that "Economy" will move all support activity to Denmark.		Proposed	Jenny Hansen	Administration					ECON TIME PER
R-0013	Low market position => No in-sale after project completion	We are in general not good enough within marketing. The external expert says we should strengthen our marketing to win the sales.		Proposed	Salmer Risk	Project 1					ECON TIME PER

- Update your data in an Excel spreadsheet and import to EasyRisk Manager

View and export statistics



Reporting – make custom reports based on selection criteria

EasyRisk Manager

Database: A4_DEMO_UpstreamCarpet Period: JAN 11 (7) LoginId: DNV Org: SPS Contractor Licensed to: DNV

Frontpage Add Reports Ordered lists Matrix Selection Statistics Custom reports Setup Admin Help

Risk Action Incident Advanced >> From: to: Date Fields Search

Owner/Responsible(1/20) Organisation(0/14) Status(1/7) Target(0/4) Treatment strategy(0/5) Category(0/8) ProjectPhase(0/5) Stakeholder(0/8) Hotspots

Bill Hanson R&D Department Proposed Rejected Cost Take
Boris Pankov -RASTER R&D Pro Strategic Projects Schedule Performance Treat
Christian Asaberg Operator EPCM Contractor Transfer
DNV user Semi-sub Contractor Terminate
Edward Mbeki UFL Contractor
Garry Shoestring -SPS Contractor
Gilles Permentier -Offshore Contract
Gunther Schmidt -Living Quarters C
Jack Ng Process module cor
Jaques Killy P & G Module Contr
Jenny Pettersen
John Edson

Below New window Use Control Click to select more than one, or remove the last selected.

Risk Risk with Actions Matrix New Risk Risk to Risk Status Status before/after Trend Changes Age Statistics Custom reports Select List

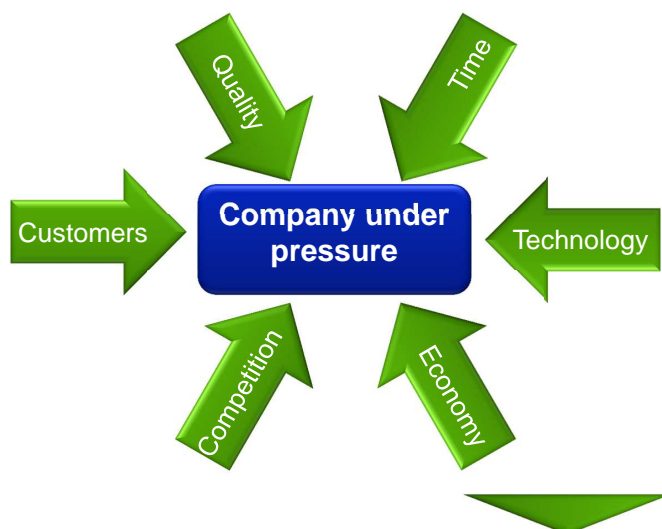
1. Choose your selection criteria

2. Select report format

OPERATIONAL IMPROVEMENT

- ✓ Why do companies undertake an operational improvement programme?
- ✓ What is an operational improvement programme?
- ✓ How is an operational improvement programme done?

Companies commonly perform operational improvement programmes to reduce costs, increase quality and reduce production time



Operational improvement programme

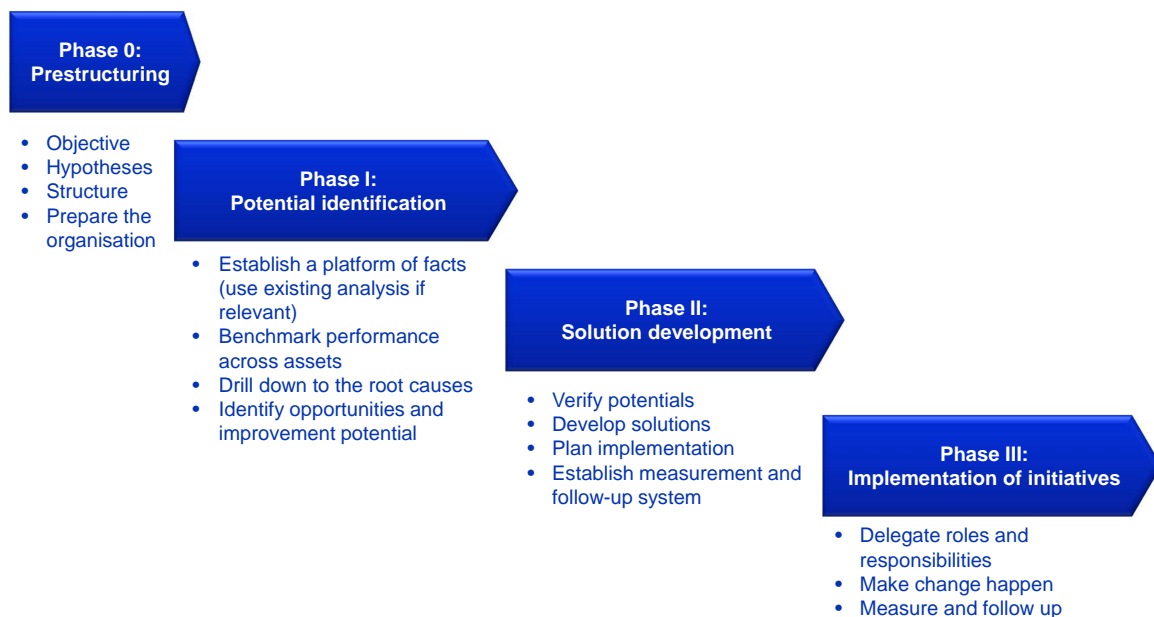
- Focused attention from experienced DNV personnel
- Staffing can be short-term – DNV can mobilise international team of change experts
- “Quick wins” provide quick payback
- Ensure that knowledge is transferred to client

Streamlined processes – Quality improvements – Cost reduction – Continual improvement – Prioritisation of internal initiatives – Enhanced throughput

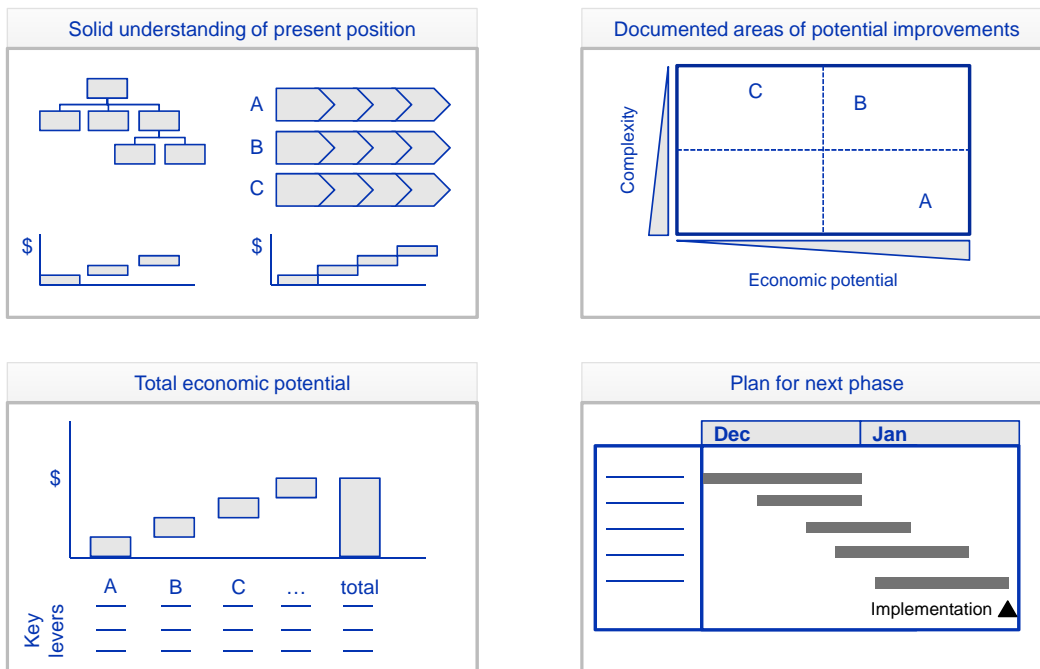
We have successfully delivered projects of a similar nature and scale across many industries



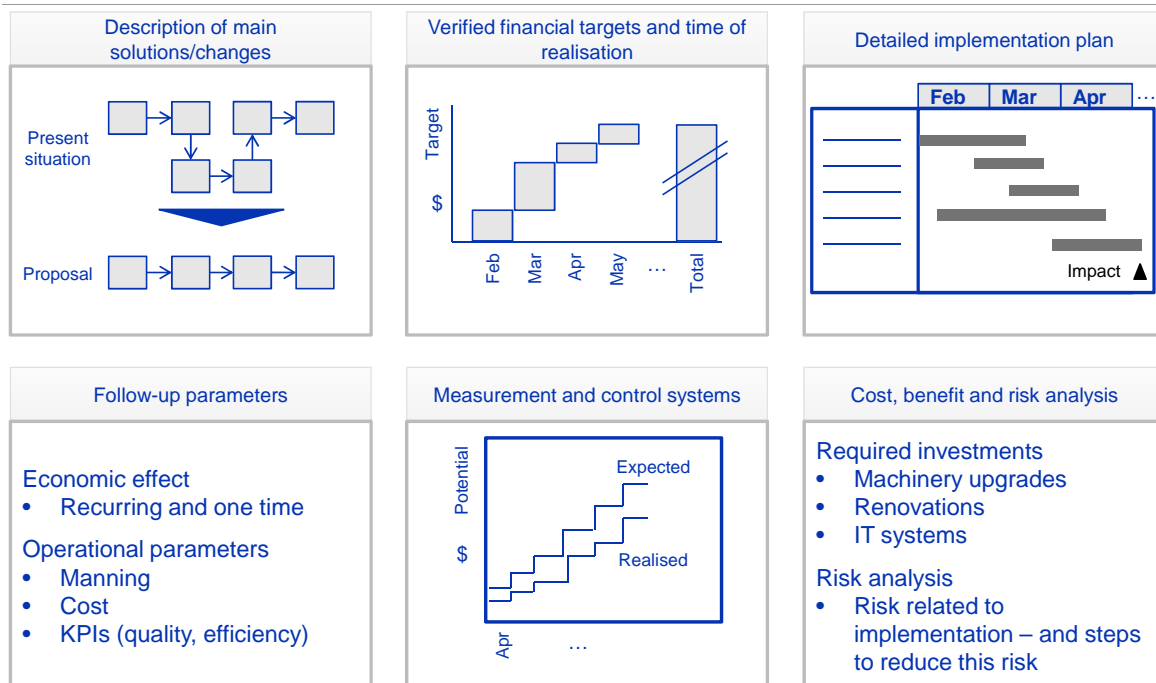
Roadmap for a typical improvement programme



Deliverables after phase 1: Solid understanding of present position and potential improvements



Deliverables after phase 2: Concrete action plans ready for implementation



Summary of operational improvement programme

- Operational improvement programmes can incorporate elements of lean, six sigma etc.
- DNV works closely with a client team, to ensure maximum impact and knowledge transfer (typically based at client site)
 - Key processes are mapped out
 - Improvement initiatives are prioritised by potential and difficulty
 - Implementation plan is created
 - Implementation is performed and monitored
- Focus of programme decided according to client's priorities
 - Which processes?
 - Which sections?
 - What are the objectives?

Enterprise Risk Management – Summary

- We presented three selected example Enterprise Risk Management services
- The Clean Technology Centre is available to discuss what services you may need

**COST & SCHEDULE RISK
ANALYSIS**

EASY RISK MANAGER

**OPERATIONAL
IMPROVEMENT**

Safeguarding life, property and the environment

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