



Economic Evaluation of Upstream Technology

Beyond NPV & IRR: touching on intangibles

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Beyond NPV & IRR

- 1. Alternative indicators for tangibles**
- 2. Intangible benefits**
- 3. Conclusions**

Beyond NPV & IRR

- 1. Other indicators for tangibles**
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1. Other indicators for tangibles

COST SAVING

- incremental NPV / R&D costs
- average incremental NPV per application / average application costs
- potential cost saving per application / R&D costs
- potential cost saving per application / application costs

PRODUCTION INCREASE

- value of average incremental production per application / R&D cost
- value of average incremental production per application / application costs

EXPECTED LIFE OF THE TECHNOLOGY

- R&D costs / expected life of the technology
- expected life of the technology / years of R&D

Other indicators for tangibles

LOW PRICE SCENARIO - 18 \$/bbl

COST SAVING	CROSSWELL SEISMIC	EXPANDABLE TECHNOLOGIES	MULTIPHASE BOOSTING OFFSHORE	MULTIPHASE BOOSTING ONSHORE
incremental NPV / R&D costs	19,14	8,20	0,20	0,07
avrg incremental NPV per appl. / avrg appl. costs	59,44	n.a.	0,94	1,54
potential cost saving per appl. / R&D costs	0,49	0,03	0,31	0,00
potential cost saving per appl. / appl. costs	1,52	n.a.	1,47	0,00

PRODUCTION INCREASE	CROSSWELL SEISMIC	EXPANDABLE TECHNOLOGIES	MULTIPHASE BOOSTING OFFSHORE	MULTIPHASE BOOSTING ONSHORE
value of avrg delta production per appl. / R&D costs	13,08	39,00	0,26	0,21
value of avrg delta production per appl. / application costs	40,64	n.a.	1,25	4,75

EXPECTED LIFE OF THE TECHNOLOGY	CROSSWELL SEISMIC	EXPANDABLE TECHNOLOGIES	MULTIPHASE BOOSTING OFFSHORE	MULTIPHASE BOOSTING ONSHORE
R&D costs / expected life of the technology [k€/anno]	103,32	48,72	2,79	1,63
expected life of the technology / years of R&D	5	10	0,79	0,79

Beyond NPV & IRR: intangible assessment

1. Other indicators for tangibles
- 2. Intangible benefits**
3. Conclusions

2. Intangible benefits

Rating system for intangible benefits

Intangible assessment

A qualitative valuation of intangible benefits for different technologies based on an assessment methodology.

This methodology allows us to rank technologies based on their relative contribution to total corporate intangible value.

ASSESSMENT DELLE RICADUTE "INTANGIBLES" DEI PROGETTI DI RICERCA E SVILUPPO	
CROSSWELL SEISMIC	VALUTAZIONE GLOBALE 1-5 4,45
1 IMPORTANZA STRATEGICA DELLA TECNOLOGIA	4,60
1.1 <i>RILEVANZA NEL PIANO STRATEGICO</i>	
<ul style="list-style-type: none">- La tecnologia in questione è parte integrante del piano di business aziendale?- Lo sviluppo della tecnologia rientra in piani di sviluppo più ampi?- I risultati attesi della R&D potrebbero causare anche cambiamenti organizzativi (ex. nuove divisioni...)?- L'azienda mira ad acquisire una posizione di leadership in questa tecnologia?	
VALUTAZIONE 1-5	MEDIA PESATA
4,0	0,80
1.2 <i>RILEVANZA SUL BUSINESS ATTUALE</i>	
<ul style="list-style-type: none">- Esistono problemi che la compagnia può risolvere solo con questa tecnologia?- Il mancato sviluppo della tecnologia potrebbe provocare un gap competitivo per la azienda?- La tecnologia rafforza la posizione aziendale in un'area tecnica in cui era carente?- La tecnologia sotto studio permetterà di:<ul style="list-style-type: none">Affacciarsi su nuovi mercati, in nuovi ambiti competitivi?Fornire nuovi servizi/prodotti?Far crescere il business attuale?Collaborare in partnership strategiche?	
VALUTAZIONE 1-5	MEDIA PESATA
5,0	1,50
1.3 <i>RILEVANZA SUL BUSINESS POTENZIALE</i>	
<ul style="list-style-type: none">- Quante applicazioni della tecnologia sono previste in futuro?- Per quale arco di tempo si pensa di ottenere benefici dalla tecnologia?- Esiste una tecnologia equivalente all'esterno? E' possibile acquistarla?- Sarà possibile in seguito vendere la tecnologia?	
VALUTAZIONE 1-5	MEDIA PESATA
5,0	1,50

Intangible assessment

Strategic relevance of the technology (strategy)

- *Relevance in strategic plan*
- *Relevance in current business*
- *Relevance on potential business*
- *Synergy effects on overall portfolio*

Visibility, reputation, partnership (external)

- *Partnership*
- *Visibility*
- *HSE & Social*
- *Excellence level*

Corporate know-how improvement (internal)

- *Level of technology innovation*
- *Information sharing*
- *Ownership - IP*

Intangible assessment

Each technology is evaluated according to the previous three categories:

The assessment is based on the evaluation of each sub-category with a mark from 1 to 5 arrive at a global value for each technology

	EVALUATION 1-5	WEIGHTS
1 STRATEGIC RELEVANCE OF THE TECHNOLOGY	0,33	4,60
1.1 RELEVANCE IN STRATEGIC PLAN	4,0	0,20
1.2 RELEVANCE IN CURRENT BUSINESS	5,0	0,30
1.3 RELEVANCE ON POTENTIAL BUSINESS	5,0	0,30
1.4 SYNERGY EFFECTS ON OVERALL PORTFOLIO	4,0	0,20
2 VISIBILITY, REPUTATION, PARTNERSHIP	0,33	4,25
2.1 PARTNERSHIP	4,0	0,35
2.2 VISIBILITY	5,0	0,35
2.3 SOCIAL REPUTATION	1,0	0,10
2.4 EXCELLENCE LEVEL	5,0	0,20
3 CORPORATE KNOW-HOW IMPROVEMENT	0,33	4,50
3.1 LEVEL OF TECHNOLOGY INFORMATION	5,0	0,50
3.2 INFORMATION SHARING	4,0	0,25
3.3 CHANGES IN INTERNAL STRUCTURE	4,0	0,25
		4,45

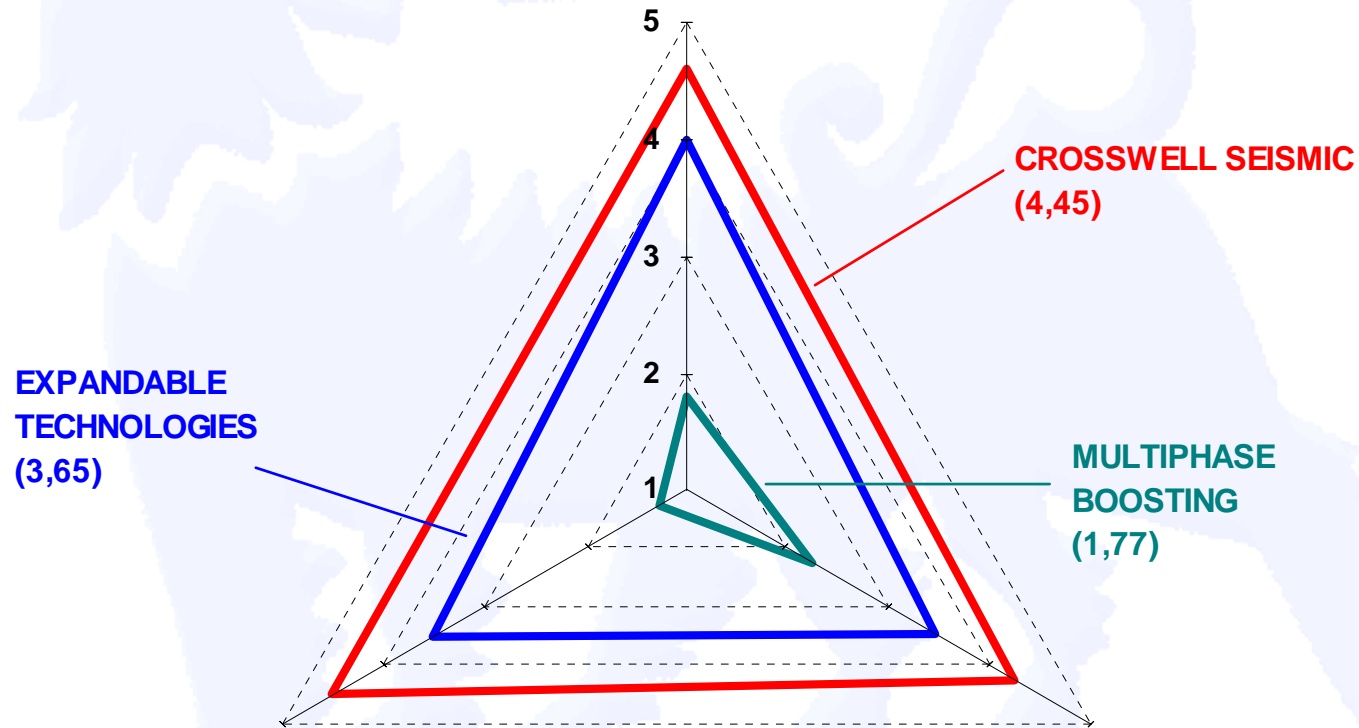
Intangible assessment

			4,45	GLOBAL EVALUATION
1 <u>STRATEGIC RELEVANCE OF THE TECHNOLOGY</u>	EVALUATION 1-5	0,33	4,60	
1.1 <i>RELEVANCE IN STRATEGIC PLAN</i>	4,0		0,20	
1.2 <i>RELEVANCE IN CURRENT BUSINESS</i>	5,0		0,30	
1.3 <i>RELEVANCE ON POTENTIAL BUSINESS</i>	5,0		0,30	
1.4 <i>SYNERGY EFFECTS ON OVERALL PORTFOLIO</i>	4,0		0,20	
2 <u>VISIBILITY, REPUTATION, PARTNERSHIP</u>		0,33	4,25	
2.1 <i>PARTNERSHIP</i>	4,0		0,35	
2.2 <i>VISIBILITY</i>	5,0		0,35	
2.3 <i>SOCIAL REPUTATION</i>	1,0		0,10	
2.4 <i>EXCELLENCE LEVEL</i>	5,0		0,20	
3 <u>CORPORATE KNOW-HOW IMPROVEMENT</u>		0,33	4,50	
3.1 <i>LEVEL OF TECHNOLOGY INFORMATION</i>	5,0		0,50	
3.2 <i>INFORMATION SHARING</i>	4,0		0,25	
3.3 <i>CHANGES IN INTERNAL STRUCTURE</i>	4,0		0,25	

WEIGHTS

Intangible assessment

Strategic relevance



Know-how improvement

Visibility, reputation, partnership

How to quantify intangibles

After generating a ranking of the technology, we estimated the contribution of each technology to the total intangible value of the portfolio

But... what is the whole intangible value of the technology portfolio?

We assumed 3 different values for overall intangibles

- **R&D expenses (100 mln € per year, structure costs included)**
- **3 % of E&P revenues**
- **5 % of E&P revenues**

How to quantify intangibles

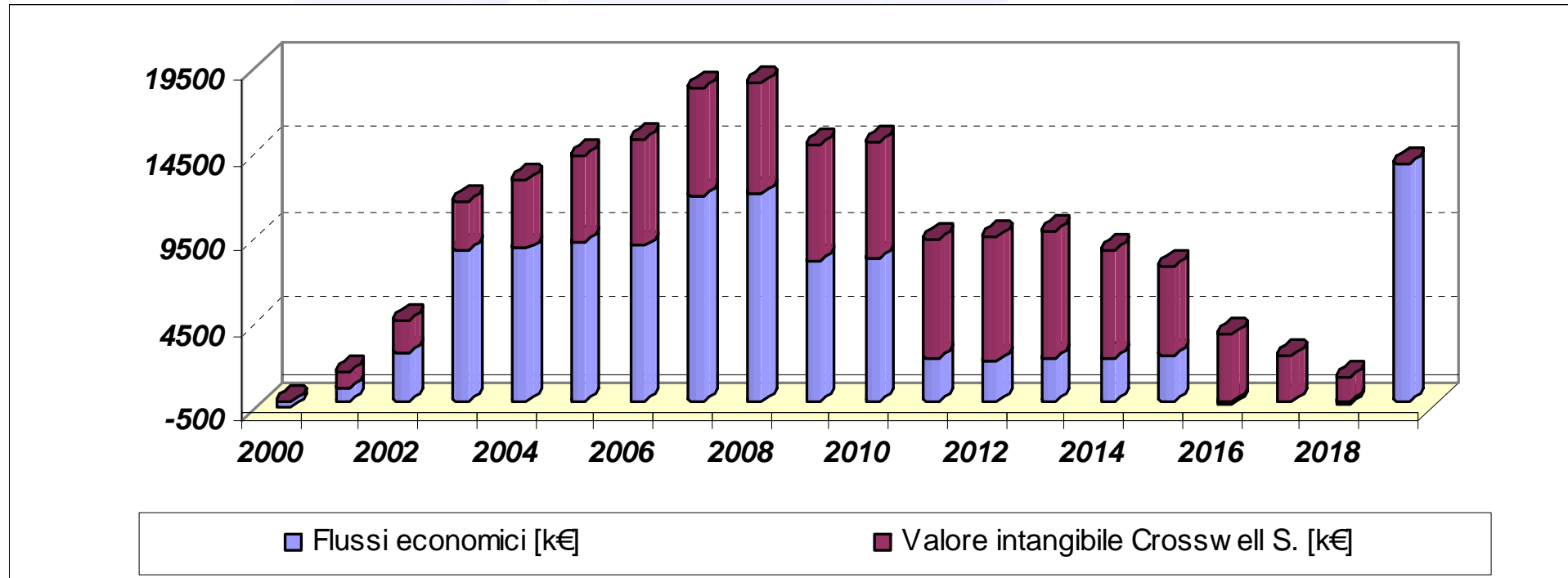
By means of the rating obtained under the “Intangible Assessment” procedure, we can try to distribute intangible value of R&D over the three technologies considered

Intangible Values (million €)

Technology	5% E&P Income	3% E&P income	100 million €
Crosswell Seismic	330	198	43
Multiphase Boosting	128	77	17
Expandable Technologies	269	161	35

Putting it all together – total value of technology

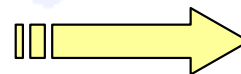
Crosswell Seismic - Scenario 1C



Tangibles only

IRR 460%

NPV 58 mill €



With intangibles

IRR 735%

NPV 101 mill €

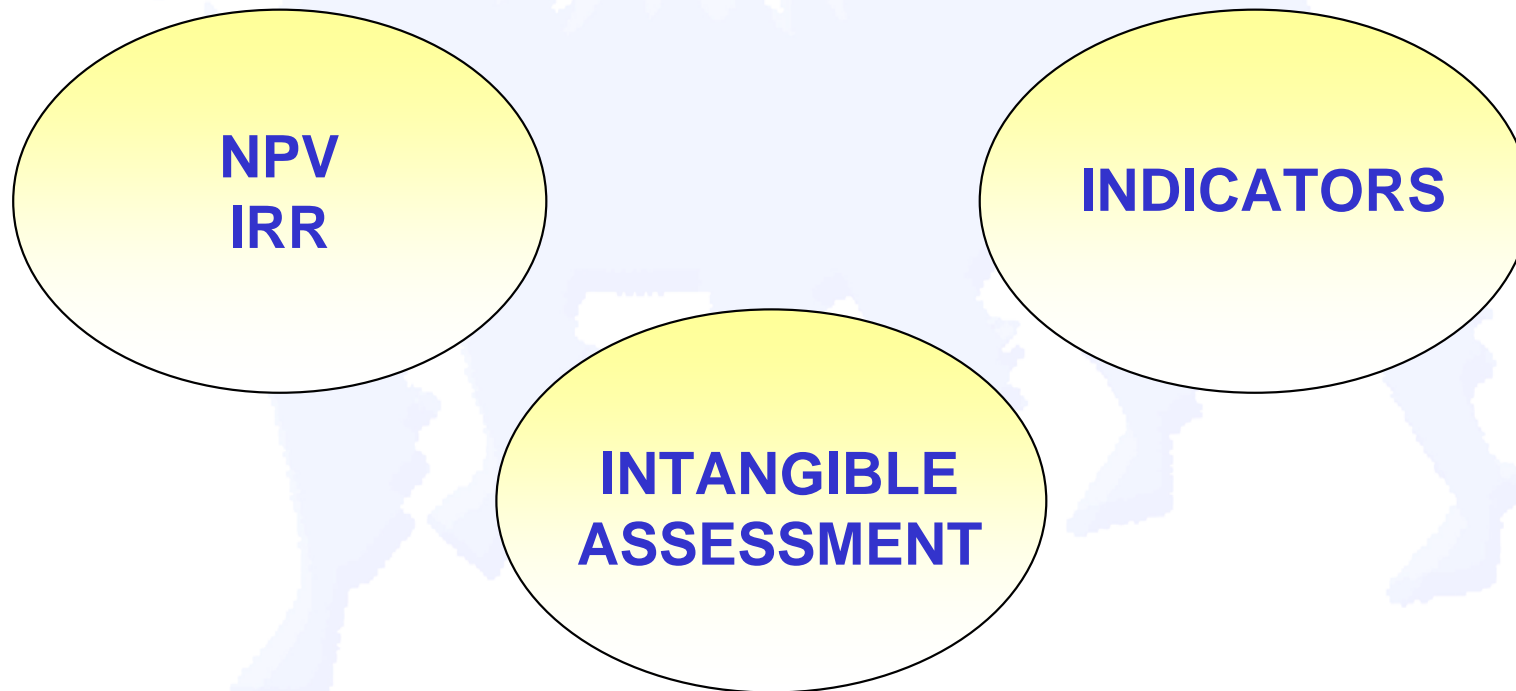
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3. Conclusions

It is challenging to find a simple method to assess the value of an R&D project taking into account intangible and tangible values

It is useful taking into account a combination of different assessment methodologies in order to estimate the overall value of a technology.





Thank you for your attention