

TWO CASE STUDIES ON THE « SAFER BY DESIGN » ADOPTION OF NANOMATERIALS

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Summary

Results of students' experience with two case studies using the Safer-By-Design (SBD) approach

- *Tire industry: Michelin*
- *Agribusiness sector: Anéolia*

1) Motivation and context

- *Evaluation of « Safer By Design » Approach using the two case studies: Anéolia and Michelin*

2) Methodology

- *Challenge case study event at Novancia Business school (october, 2016)*
- *Course "Sustainable development and Eco-innovative activities"*
- *Master degree*

3) Results and discussion

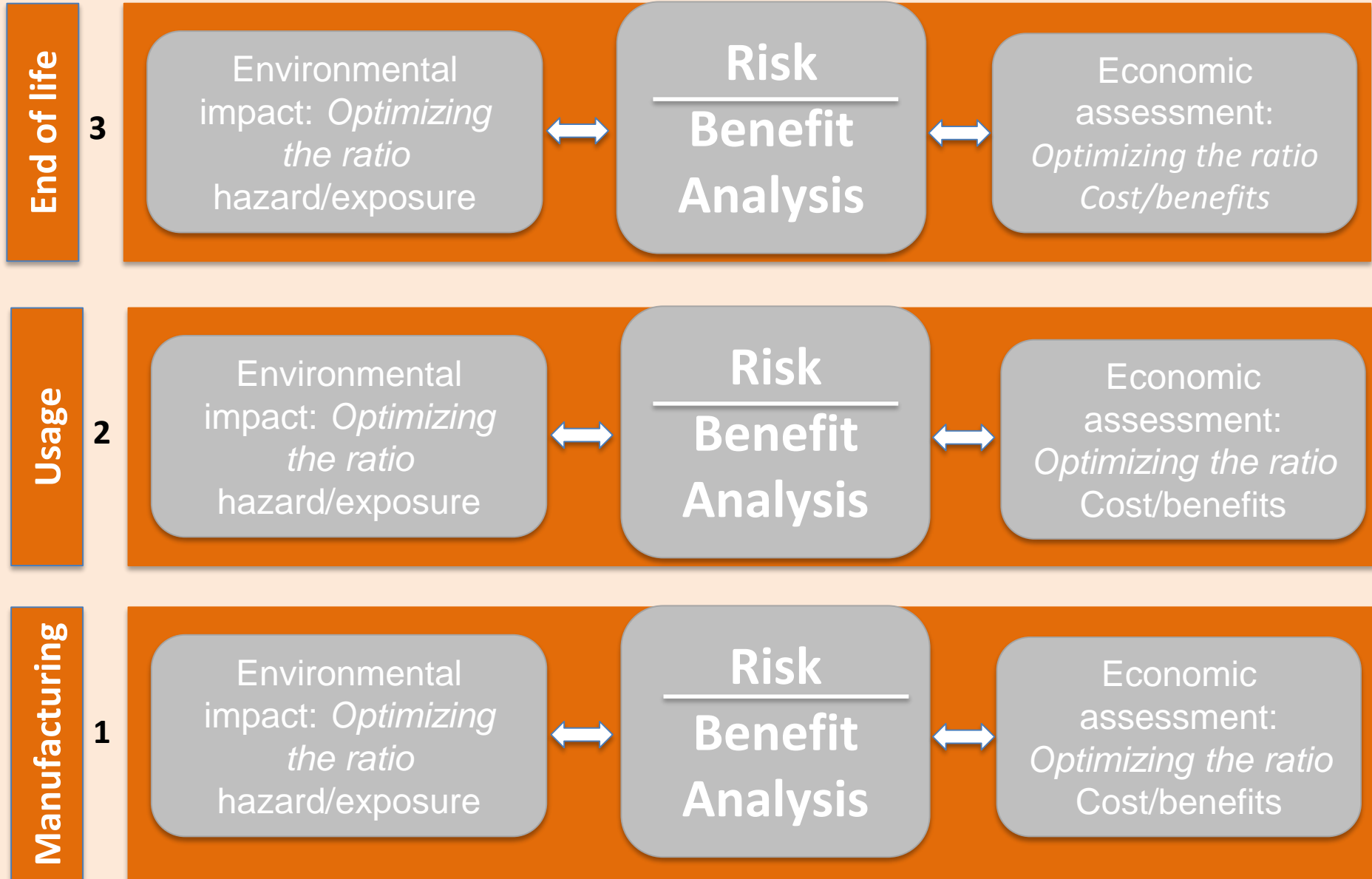
1- Motivation and context

- **The development of new approaches for education, increasing demand for specific professional knowledge has been emphasized by the European Commission.**

→ Among the European educational initiatives to support sustainable nanotechnology, the French program Labex SERENADE has been initiated and promotes the adoption of the SBD.

Safe by Design approach: "A design process that seeks to minimize health and environmental risk in a life cycle perspective" (Auplat C., et al, 2015)

The SAFER BY DESIGN (SBD) approach



Source : Auplat *et al.*, 2015, SNO

1 – Motivation and Context

- SBD approach follows the other methods of risk assessment in SHS (social and human sciences) in the field of Strategic management and particularly in Cost/benefit model and life cycle analysis. But it integrates the whole life cycle stages and also the health impacts.
- At the emerging stage but provides a promising contribution to reducing the uncertainty of nanotechnologies adoption
- Reconcile risk assessment and economic competitiveness throughout the product life cycle.

→ Proactive approach to assess the potential Benefits/risks related to the use of nanomaterials throughout the whole life cycle of the products.

Risk/benefits Assessment table of the SBD approach:

Summary of potential IMPACTS: ENVIRONMENT, HEALTH, ECONOMIC AND SOCIETAL throughout the product life cycle

*Rating: From -3 (very strong negative impact)
to + 3 (very strong positive impact)*

	Environmental impacts	Health impacts	Economic Impacts	Societal Impacts
Manufacturing				
Usage				
End of life				
Comments				

2 - Methodology

Anéolia



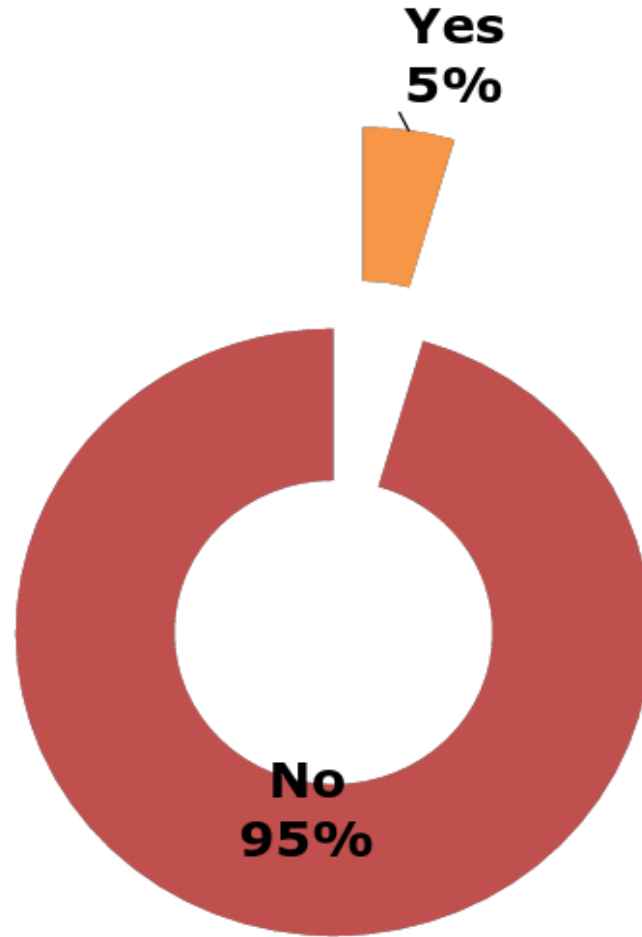
MICHELIN

- **Two case studies designed at Novancia:**
 - **Anéolia** : Environmental display through the integration of an intelligent labeling using nanotechnology (negative perception) in the fight against waste (positive perception)
 - **Michelin** : Green Nanos ⇔ Managing radical innovation in uncertain environment: the case of future tires using the New generation of nanomaterials.
- **SBD evaluation**
 - Case study Challenge (40 students, 25% valid responses)
 - Course "Sustainable development and eco-innovative technologies"
(84 students, 52% valid responses)

→ **44 valid responses**
- **Form**
 - Qualitative analysis
 - Open answers
 - Likert scale answers (few, average, enough, strongly)

3 - Results and discussion

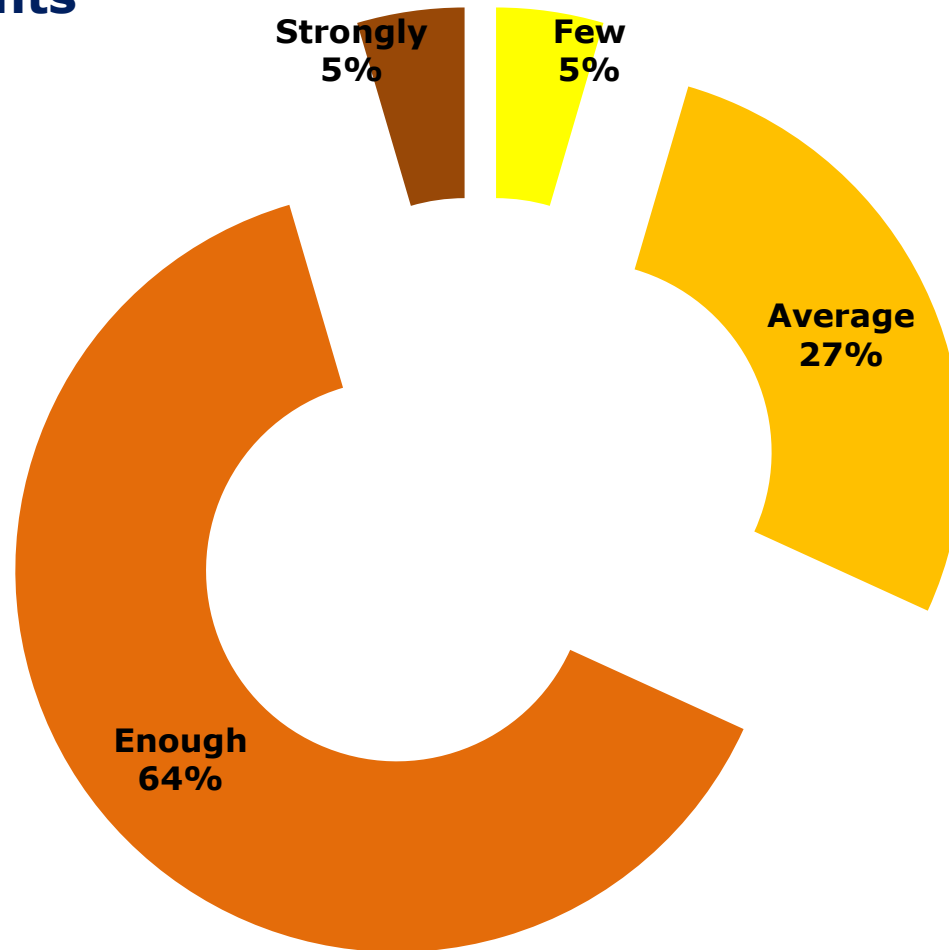
SBD: Unknown risk assessment approach for about 95% students



Knowledge of risk assessment methods or approaches

3 - Results and discussion

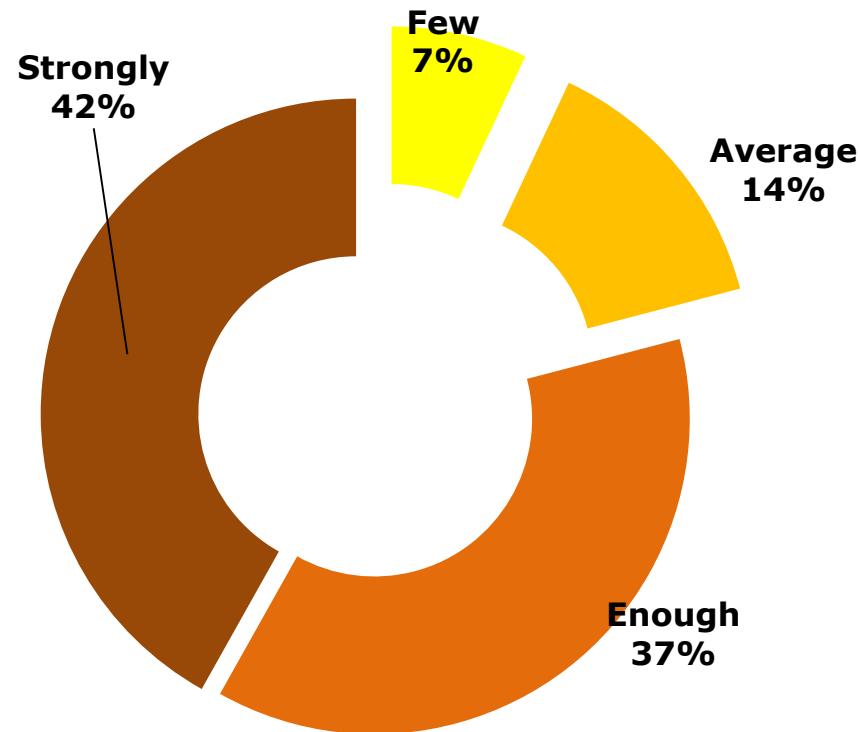
From the methodological angle, the SBD approach is easy to use for about 2/3 of students



Ease of appropriation (use)

3 - Results and discussion

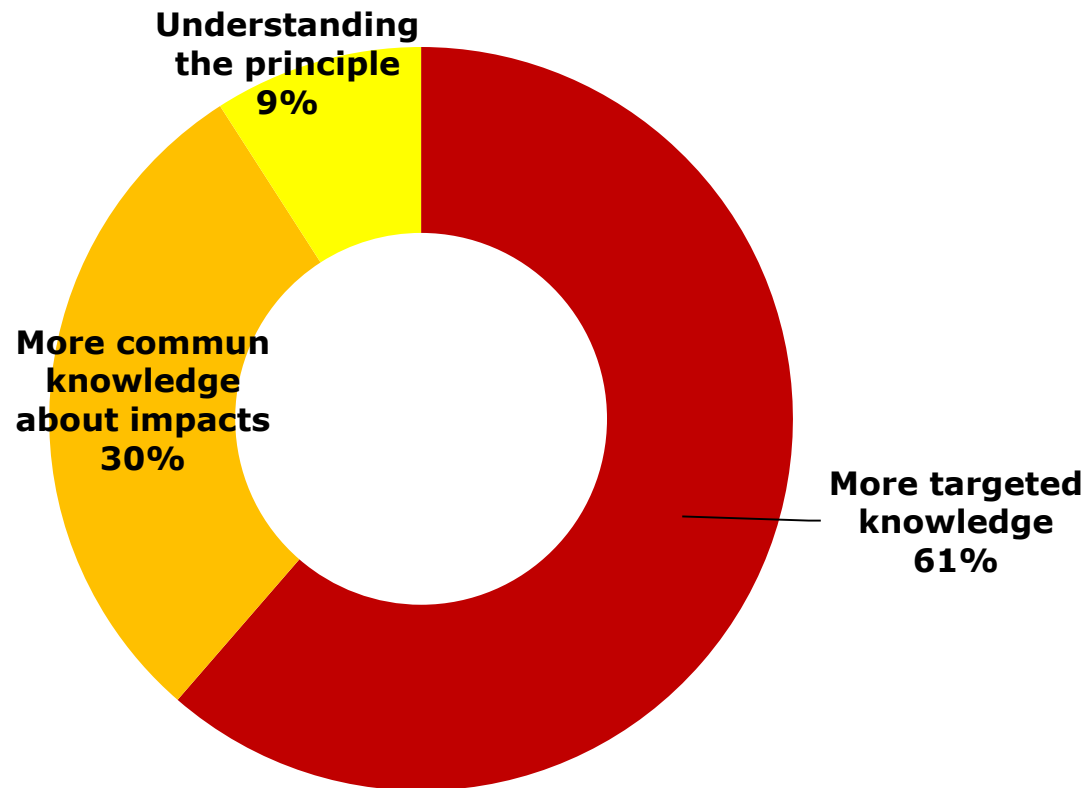
From the operational angle, the Risk/benefit assessment table is efficient, useful and synthetic.



Effectiveness of the R/B assessment table

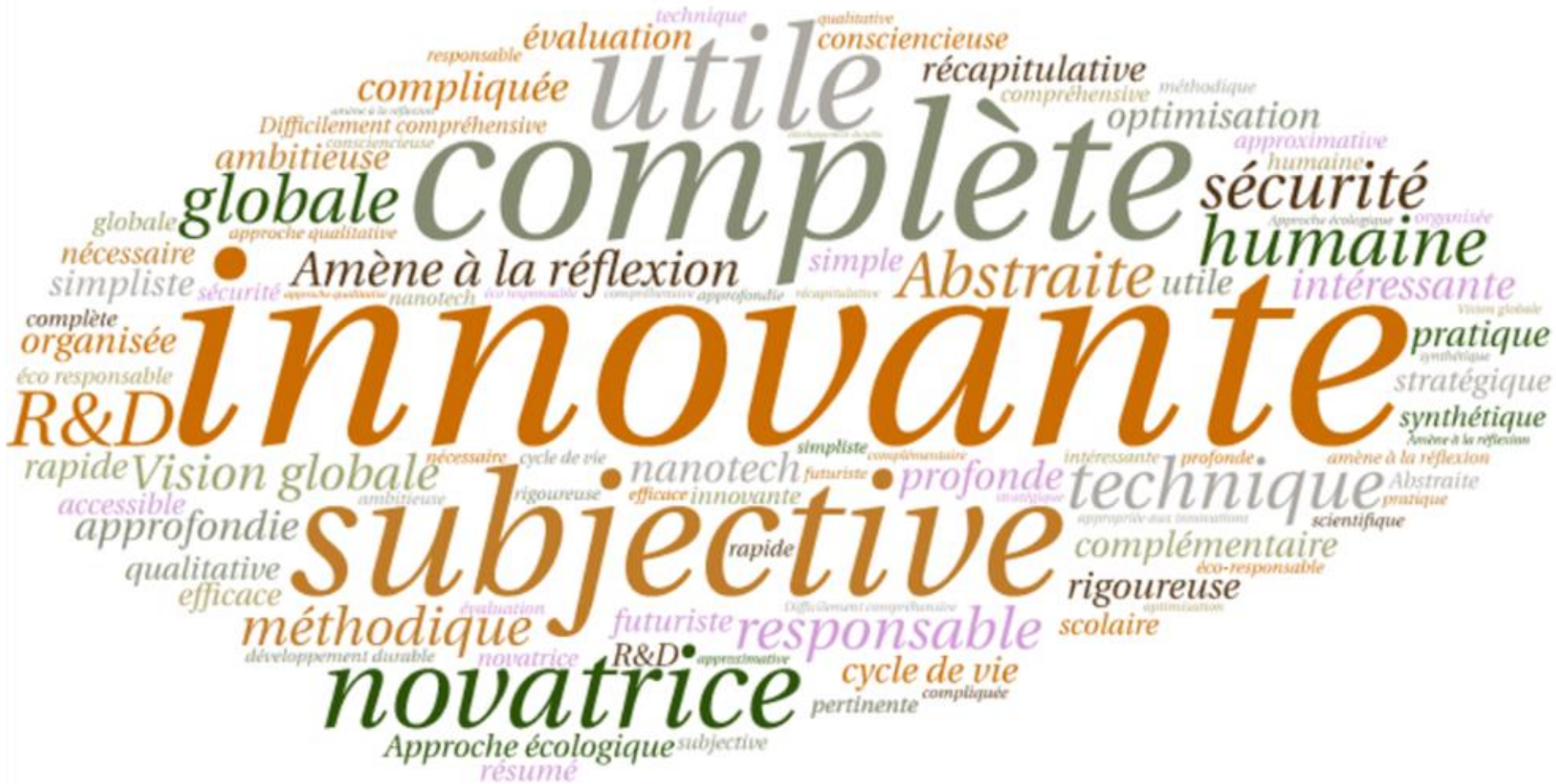
3 - Results and discussion

Necessity of preliminary information about the approach before use and adoption



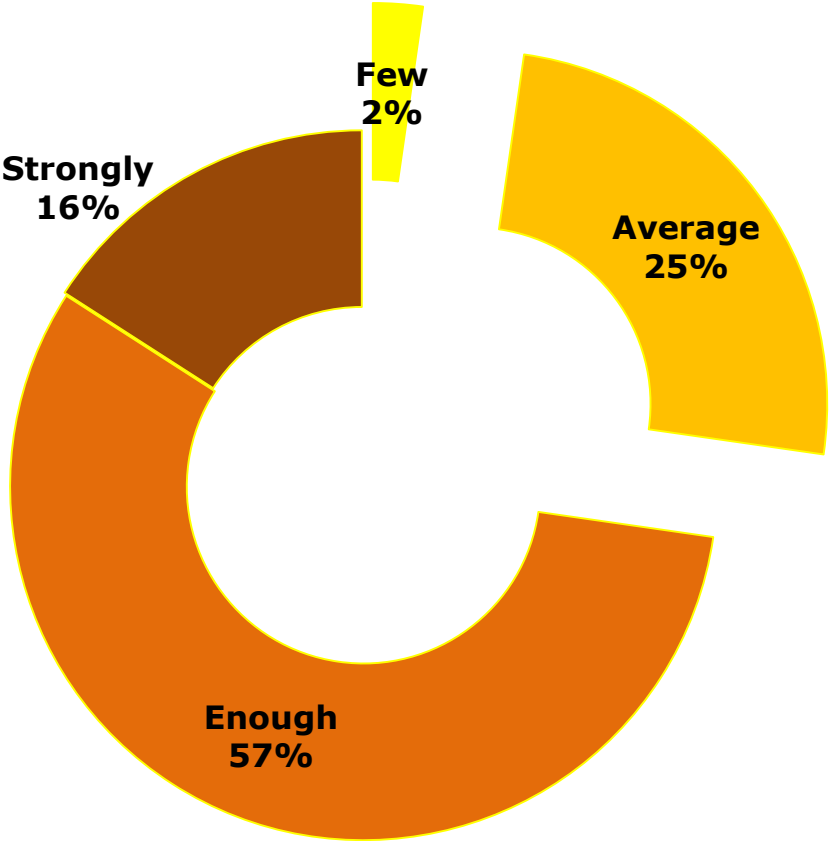
Main difficulties to use the SBD approach

This SBD approach is qualified as



3 - Results and discussion

Applied to Nanotechnologies the SBD approach is considered as positively effective and very helpful



Use of the approach in the context of nanotechnologies: Effectiveness

3 - Results and discussion

Main results

- The SBD approach: useful, effective with the case studies used (from the methodological and the operational angles)
- With complementary information (about nanos), the approach would be useful for the case of nanotechnologies.
- This approach is considered as innovative, complete.
 - Considers human security
 - Ecological aspects

3 - Results and discussion

Limits

- For social and human science student profiles, necessity of:
 - More targeted knowledge on Nanotechnologies, not very available specifically in French language today
 - More knowledge on the risk assessment aspect to evaluate the impacts of radical innovation on society
- Lack of theoretical basis and established knowledge on nanotechnologies' impacts
- The approach remains subjective (about the impacts)

3- Results and discussion

RECOMMENDATIONS

- Integrate the SBD approach in courses on risk assessment of nanotechnologies to introduce students to new approaches to assessment (OECD, 2014)
- Students need some complementary knowledge on nanotechnologies impacts before using the SBD approach, otherwise there will be some difficulties to consider with both the SBD approach and Nanos.

Bibliography

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Thank you for your attention



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