# Nanomaterial Safety Management in Practice: Stakeholder Perspectives on Implementation Challenges and Organizational Approaches in Singapore



1 experts (7%)

3 experts (21%)

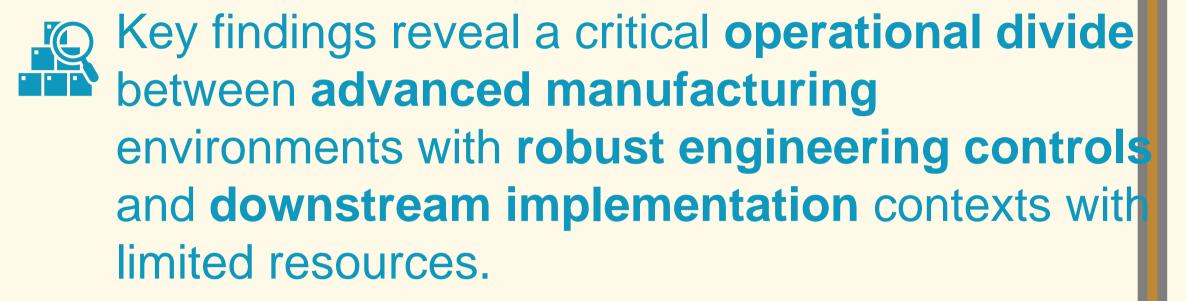
4 experts (29%)

6 experts (43%)

THE UNIVERSITY OF Mr. Sriram Prasath
NEWCASTLE Dr. Kavitha Palaniappan
AUSTRALIA Prof. Sally Chan

# Abstract







Results highlight the need for tailored safety approaches addressing diverse organizational contexts.

# Methodology

Inclusion criteria: Minimum 5 years experience in nanotechnology sector



Participants: 14 subject matter experts across industry, research, and regulatory domains



Sampling: Purposive sampling supplemented with snowball recruiting



Data Collection: Semi-structured interviews conducted virtually (26-64 min) based on NTRC questionnaire



Analysis: Thematic analysis using MAXQDA with combined deductive/inductive coding

## Results

#### **Participant Expertise**



## Thematic Analysis of Nanomaterial Safety Management

27%	Advanced Manufacturing & Implementation	
	Control effectiveness	39%
	Implementation patterns	38%
	Scale-dependent protocols	1396
	Manufacturer vs downstream	1096

21%	Training & Knowledge Management	
	Knowledge transfer	45%
	Gap in nano-specific training	2496
	Training effectiveness	1696
	Resource limitations	996
	Access to expertise	7%

Participants Years of Experience (n =14)

19%	Geographic & Regulatory Variations	
	Regulatory variations	8096
	Implementation maturity	1696
	Infrastructure availability	396
	Implementation patterns	196

16%	Documentation & Risk Management	
	Assessment protocols	3196
	Information accuracy	2896
	Hazard characterization	2396
	Framework adequacy	1496
	SDS limitations	596

11%	Information Management & Practices	
	Strategic information sharing	4496
	Public trust management	2396
	Cross-organizational knowledge	1996
	Proprietary information protection	1196
	Internal safety documentation	496

Measurement & Characterization	
Particle characterization	44%
Measurement integration	1696
Technical barriers	1696
Monitoring limitations	1696
Analytical constraints	996

#### Analysis of 14 expert interviews across industry, research, and regulatory domains (n=501 coded segments)

#### Operational Divide in Nanomaterial Safety Management





#### **Discussion and Conclusion**



Implementation Gap: Significant disconnect between theoretical guidelines and practical implementation across organizational contexts



Resource Disparity: Two-tiered system: large organizations with robust systems vs. smaller entities relying on PPE.



Regional Adaptation: Singapore's "reference-based" approach adapts established frameworks to local capabilities and requirements



Future Directions: Need for standardized training, knowledge sharing, and tailored guidelines for smaller organizations