

# Applied Nanoethics: Who is responsible for what?

Rider W. Foley<sup>1,2</sup>; Jameson M. Wetmore<sup>1</sup>; Ira Bennett<sup>1</sup>;  
Arnim Wiek<sup>1,2</sup>; David H. Guston<sup>1</sup>

<sup>1</sup>Center for Nanotechnology in Society

<sup>2</sup>School of Sustainability

Arizona State University

# Introduction & Problem Statement

- \* Ethicists created responsibilities, based on largely philosophical explorations, for scientists, engineers, and professionals engaged in nanotechnology innovation.
- \* People are applying ethics in practice through their stances and responsibilities held.
- \* There is little research (to-date) that reconciles ethics in the literature and ethics in practice.

# Research Goal & Question

## Goal:

Academic literature provides a foundation that can be strengthened by incorporating evidence from the practitioners of ethics in nanotechnology innovation.

## Focal questions of this project:

- (i) what responsibilities do actors acknowledge as their own and/or assign to others?
- (ii) can those responsibilities be mapped to the merged ethical frameworks from the literature?

# Selected Ethical Frameworks

(Berne 2008)

Tacit Beliefs			
Negotiable Claims			
Non-Negotiable			
	Individual	Professional Societal	Macro

(Allenby 2005)

# Research Design: Boundary & Scope

Real-Time Technology Assessment

Socio-cultural Characteristics

Organizations: 400 Estimated



# Methods

- \* Interviews with practitioners used to elicit all actors named and secondly statements on responsibility
- \* Clustering statements on responsibility (like-like)
- \* Assignment of responsibility to dimensions & levels using coding system

# Who are the practitioners engaged?

- \* Academic researchers (scientists and engineers) (n=9);
- \* Academic leadership and support (n=5);
- \* Business consulting and legal services - supporting nanotechnology business (n=6).
- \* Government funding and support (n=6);
- \* Government regulators (n=2);
- \* Industrial companies directly working with nanotechnology (n=9);
- \* Insurers (n=1);
- \* Investors (n=3);
- \* Media (n=2) and;
- \* Non-government organizations (n=2)

# Sample Data Table (of 918)

<b>Organization</b>	<b>Dimension</b>	<b>Level</b>	<b>n</b>
<b>University Researchers</b>			
Understand application of knowledge to human challenges or market gap	2	s	17
Discovery (through basic research)	1	i/s	15
Conduct Research (through experimentation)	1	s	9
Proceed with early technology development & become entrepreneurs	2	i/s	7
<b>Federal Funding Agencies</b>			
Funding Projects	1	s	22
Define research agenda	1	s	16
Evaluate potential solutions & create incentives to redefine markets	2	m	6
<b>Large Corporations</b>			
Conduct research and development of products that have market value	2	s	12
Manufacturing nano-enabled products	1	s	10
Creating demand through value-added products, marketing and selling	1	s/m	9
Commit to innovation with resources (expertise, finances, and demand)	2	i/s	8
Foresee unintended consequences of technology in localized contexts	3	s	4
<b>Entrepreneurs</b>			
Create idea and take as far as possible towards commercialization	1	i/s	17
Application of discovery to translation to market	1	i/s	9
Create radical (or novel) innovation	2	i/s	5
<b>Venture Capitalist Funding</b>			
Funding projects	1	s	21
Selecting investments	1	s	19



# Sample Data Table (of 918)

<b>Organization</b>	<b>Dimension</b>	<b>Level</b>	<b>n</b>
<b>University Researchers</b>			
Understand application of knowledge to human challenges or market gap	2	s	17
Discovery (through basic research)	1	i/s	15
Conduct Research (through experimentation)	1	s	9
Proceed with early technology development & become entrepreneurs	2	i/s	7
<b>Federal Funding Agencies</b>			
Funding Projects	1	s	22
Define research agenda	1	s	16
Evaluate potential solutions & create incentives to redefine markets	2	m	6
<b>Large Corporations</b>			
Conduct research and development of products that have market value	2	s	12
Manufacturing nano-enabled products	1	s	10
Creating demand through value-added products, marketing and selling	1	s/m	9
Commit to innovation with resources (expertise, finances, and demand)	2	i/s	8
Foresee unintended consequences of technology in localized contexts	3	s	4
<b>Entrepreneurs</b>			
Create idea and take as far as possible towards commercialization	1	i/s	17
Application of discovery to translation to market	1	i/s	9
Create radical (or novel) innovation	2	i/s	5
<b>Venture Capitalist Funding</b>			
<b>Funding Projects</b>	<b>1</b>	<b>S</b>	<b>19</b>

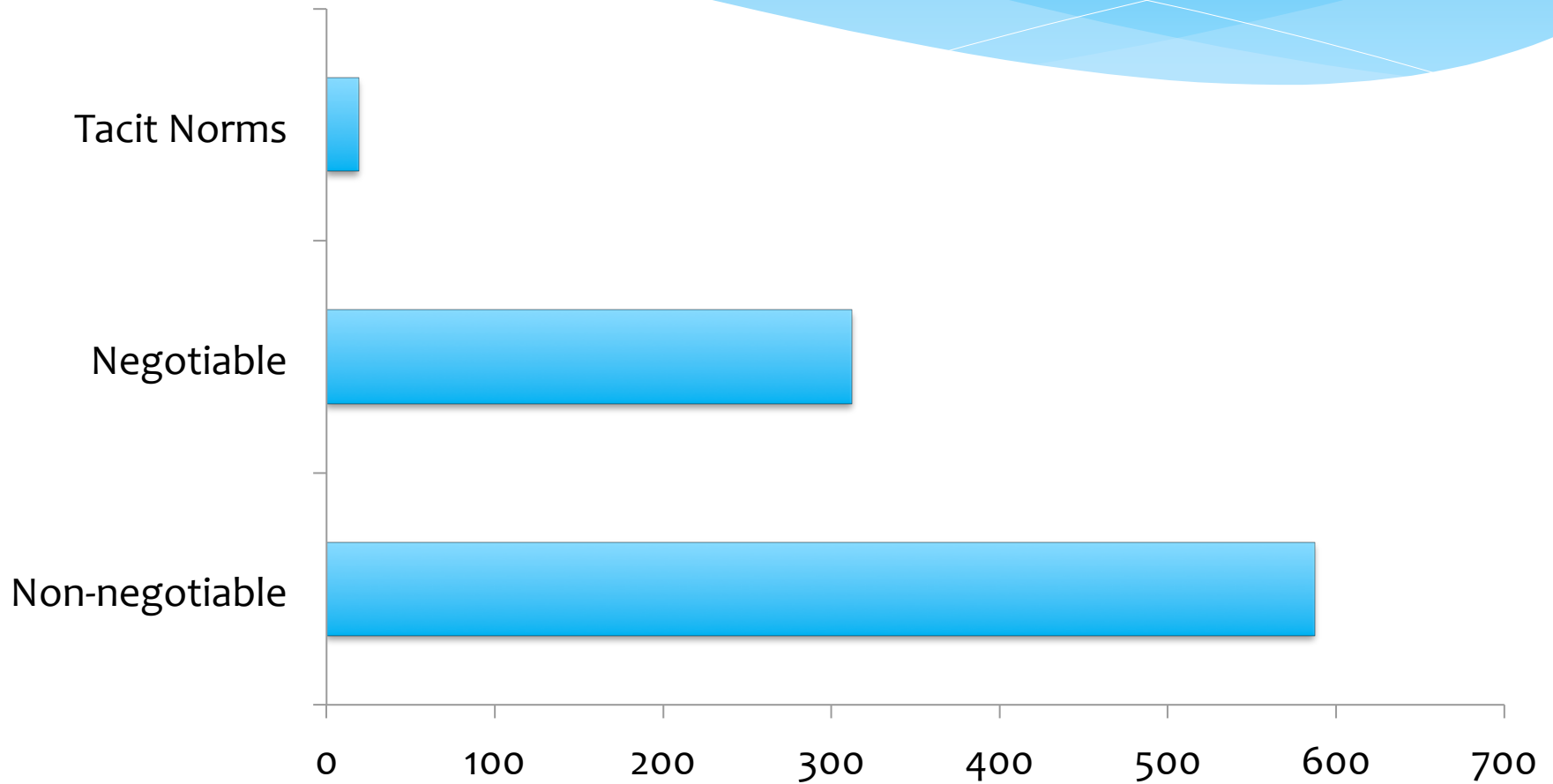
# Sample Data Table (of 918)

Organization	Dimension	Level	n
<b>University Researchers</b>			
Proceed with early technology development & become entrepreneurs	2	i/s	7
<b>Funding Projects</b>			
Define research agenda	1	s	16
Evaluate potential solutions & create incentives to redefine markets	2	m	6
<b>Large Corporations</b>			
Conduct research and development of products that have market value	2	s	12
Manufacturing nano-enabled products	1	s	10
Creating demand through value-added products, marketing and selling	1	s/m	9
Commit to innovation with resources (expertise, finances, and demand)	2	i/s	8
Foresee unintended consequences of technology in localized contexts	3	s	4
<b>Entrepreneurs</b>			
Create idea and take as far as possible towards commercialization	1	i/s	17
Application of discovery to translation to market	1	i/s	9
Create radical (or novel) innovation	2	i/s	5
<b>Venture Capitalist Funding</b>			
Funding projects	1	s	21
Selecting investments	1	s	19

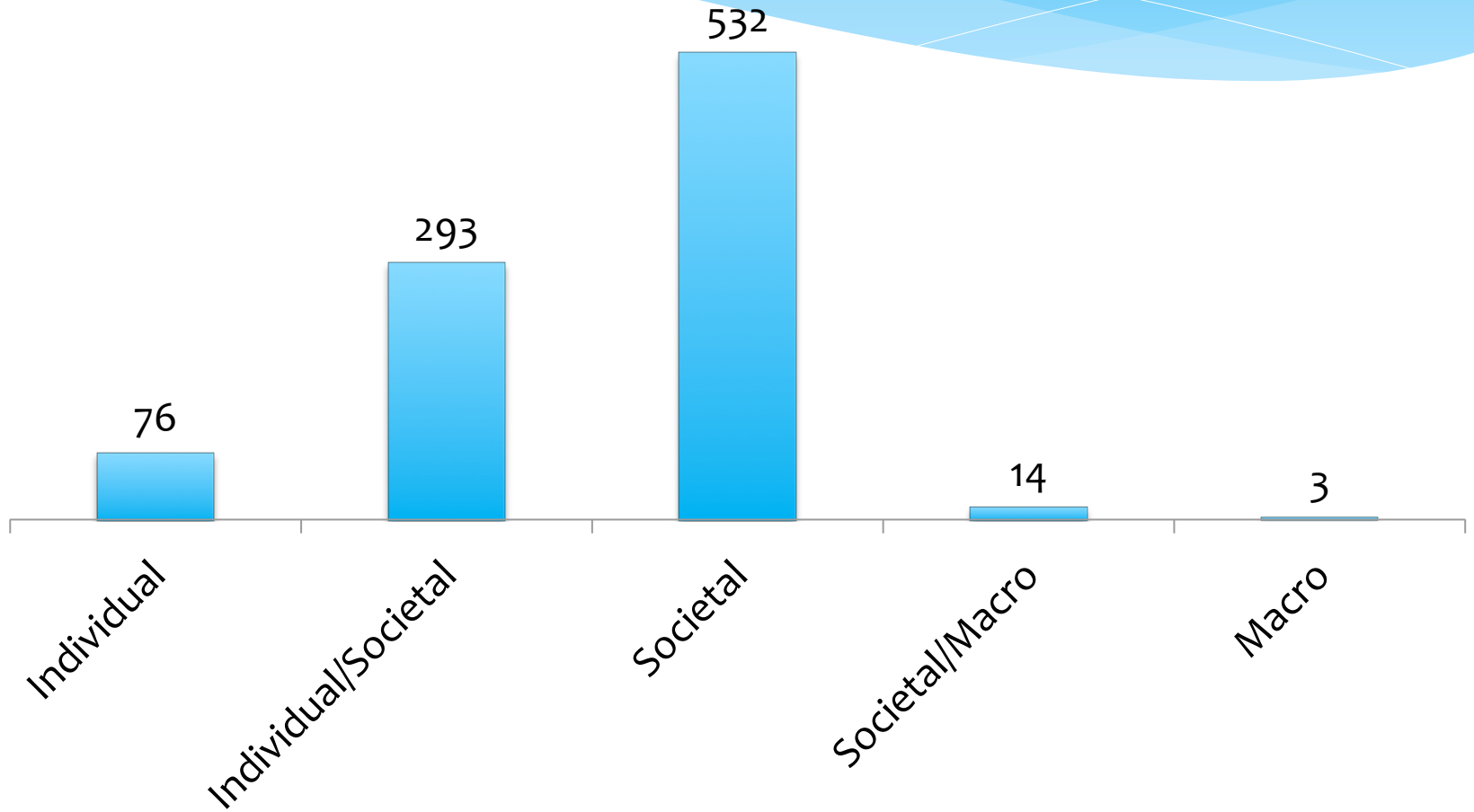
# Sample Data Table (of 918)

<b>Organization</b>	<b>Dimension</b>	<b>Level</b>	<b>n</b>
<b>University Researchers</b>			
Understand application of knowledge to human challenges or market gap	2	s	17
Discovery (through basic research)	1	i/s	15
Conduct Research (through experimentation)	1	s	9
Proceed with early technology development & become entrepreneurs	2	i/s	7
<b>Federal Funding Agencies</b>			
Evaluate potential solutions & create incentives to redefine markets	2	s/m	6
Manufacturing nano-enabled products	1	s	10
Creating demand through value-added products, marketing and selling	1	s/m	9
Commit to innovation with resources (expertise, finances, and demand)	2	i/s	8
Foresee unintended consequences of technology in localized contexts	3	s	4
<b>Entrepreneurs</b>			
Create idea and take as far as possible towards commercialization	1	i/s	17
Application of discovery to translation to market	1	i/s	9
Create radical (or novel) innovation	2	i/s	5
<b>Venture Capitalist Funding</b>			
Funding projects	1	s	21
Selecting investments	1	s	19

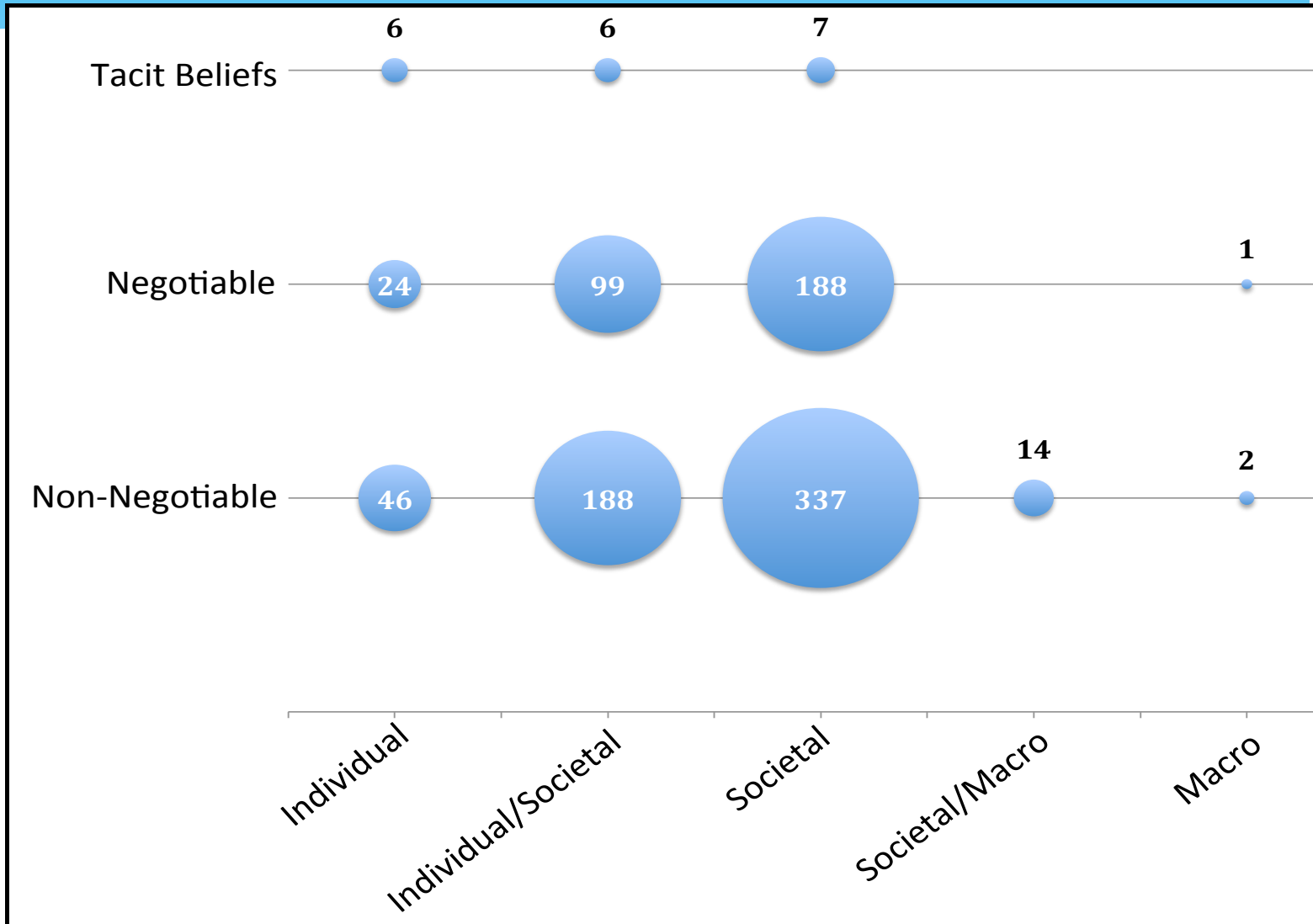
# Results: Dimension



# Results: Level



# Results: Dimension & Levels



# Discussion Points

- \* Shift from individual to professional society, yet we continue to largely teach ethics by focusing on “I”
- \* Strong recognition of negotiable claims – not all statements were non-negotiable.
- \* Every level and dimension was addressed – just not with the same frequency.

# Discussion of Methods

- \* Building trusted relationships opened doors.
- \* Open-ended question: What are the responsibilities of that person/organization? captured requisite data.
- \* Diverse sampling and quantity of interviews offers a robust data set for analysis.



# Concluding Thoughts

- \* The evidence from this study shows that practitioners think of responsibilities as being largely held by professional societies. How do we effectively and meaningfully teach ethics to professional groups?
- \* How can those contributing to the literature on nano-ethics and other techno-scientific ethical frameworks strengthen practitioners' understanding of tacit and macro-level responsibilities?

# Thank You – Dankuwel

Foley, Rider W., Ira Bennett, Jameson M. Wetmore. (2012).  
Practitioners' views on responsibility: Applying nanoethics.  
*Nanoethics*. doi 10.1007/s11569-012-0154-2