



## **Perspectives on Non-acoustic Factors, Multi-disciplinarity, Project Design and Impact**

Noise Network Plus – Launch Meeting – 18 March 2025 – Royal Academy of Engineering, London, UK

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# Presentation overview

- Noise Abatement Society (NAS) project support – key rationale
- Brief perspectives for consideration on the interconnectedness of:
  - Supporting the aim of transformative innovation
  - Two areas of diversity
  - Non-acoustic Factors
- Final thoughts

# NAS project support – key rationale

## EPSRC “Tomorrow’s Engineering Research Challenges” (TERC) report:

- Identifies noise as an area of major concern related strongly to many of the priorities, themes and challenges raised by stakeholders including *health and wellbeing*.

## The TERC aims include:

- Improve *whole-life health and wellbeing* through the development of *sustainable, inclusive and equitable solutions*.
- Foster socially and environmentally responsible approaches to engineering guided by our understanding of *human behaviours and needs*.

<https://www.ukri.org/wp-content/uploads/2022/07/EPsrc-090822-TERCReport.pdf> (2022, emphasis added)

# Noise and (mental) health

- “Health is a state of *complete physical, mental and social well-being* and not merely the absence of disease or infirmity.” World Health Organization, <https://www.who.int/about/governance/constitution> (emphasis added)
- ‘[...] *noise increase[s] the susceptibility to mental health conditions* such as depression, anxiety, suicide, and behavioural problems in children and adolescents.’ Hahad, O., Kuntic, M., Al-Kindi, S. *et al.* Noise and mental health: evidence, mechanisms, and consequences. *J Expo Sci Environ Epidemiol* **35**, 16–23 (2025, emphasis added)
- “We know that noise effects health, but we know little about how to mitigate the problem. The missions developed in the Noise Network Plus have the potential to step up mitigation efforts that will *translate into major, long-term public health gains*.”  
Professor Charlotte Clark, City St George’s, University of London, <https://www.sgul.ac.uk/news/noise-network-plus-the-1.8-million-initiative-to-engineer-a-quieter-future> (2025, emphasis added)

# Supporting transformative innovation

## Noise Network Plus aims include:

‘Bringing together diverse teams and stakeholders, the initiative will promote *inclusive dialogue and co-design innovative solutions.*’ <https://www.surrey.ac.uk/news/noise-network-plus-ps18-million-initiative-engineer-quieter-future> (2025, emphasis added)

“Through our initiative, we aim to transform the way noise is managed, *embedding innovative solutions into engineering design and policy.*” Professor Antonio J. Torija Martinez, University of Salford, <https://www.salford.ac.uk/news/noise-network-plus-the-ps18-million-initiative-to-engineer-a-quieter-future#:~:text=Bringing%20together%20diverse%20teams%20and,the%20Royal%20Academy%20of%20Engineering>. (2025, emphasis added)

## Highlighting two areas of diversity:

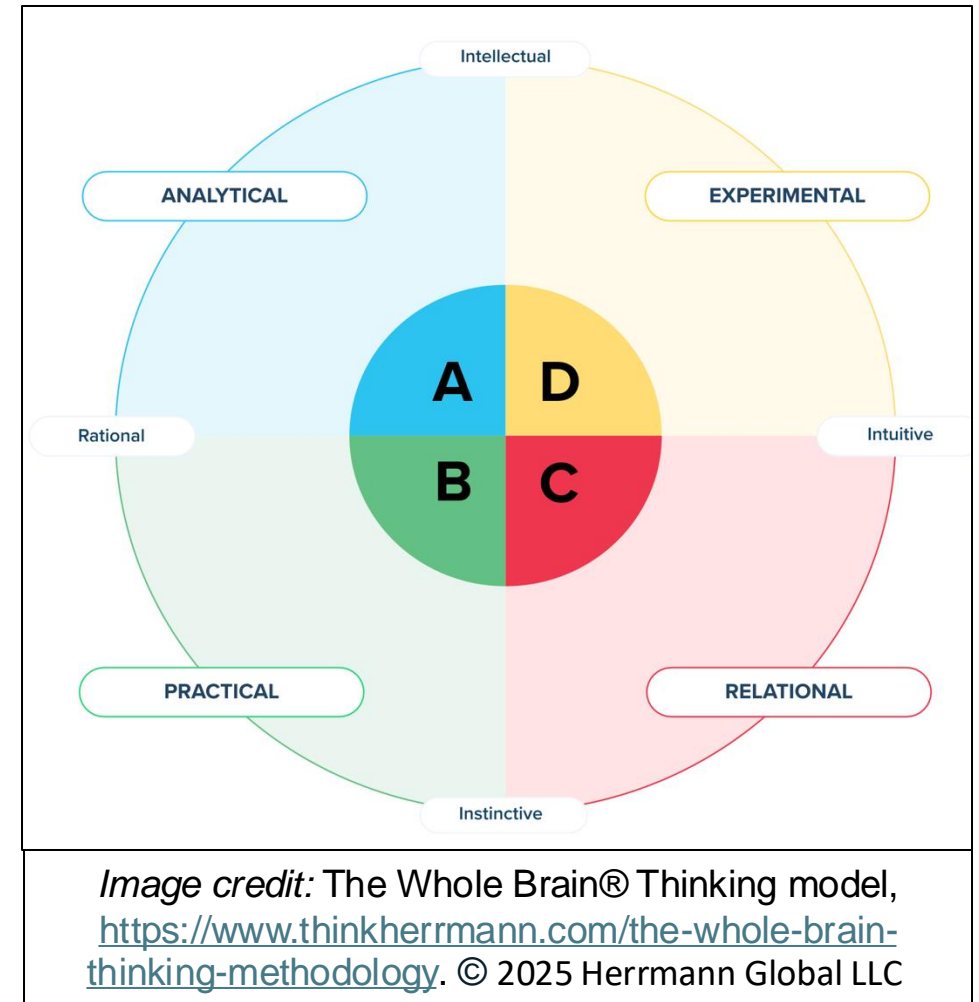
*Cognitive* (or ‘thought’) diversity and *Philosophical* diversity

# Cognitive (or ‘thought’) diversity

Broadly refers to *different ways of thinking* (even within the same discipline/discrete dimensions of diversity).

“[...] greater cognitive diversity leads hierarchical organizations to pursue exploratory ideas less often, and it leads flat organizations to pursue exploratory ideas more often. [...] *organizational structure can play a role in helping [to] harness cognitive diversity [and] become more exploratory.*”

Quist, K. (2023), [Complementing Diversity with Design: Cognitive Diversity, Organizational Structure, and Exploration](https://doi.org/10.5465/AMPROC.2023.15544abstract), <https://doi.org/10.5465/AMPROC.2023.15544abstract> (emphasis added); Quist, K. 2024. *Essays on Organizational Economics and Strategy*. Doctor of Philosophy, Massachusetts Institute of Technology. <https://dspace.mit.edu/bitstream/handle/1721.1/156641/quist-kquist-econ-2024-thesis.pdf?sequence=1&isAllowed=y> (accessed 17 March 2025).



# Philosophical (epistemological) diversity - theory of knowledge

'*epistemological distance* (a measure of differences in knowledge and ways of knowing) among disciplines can *create a barrier or a precondition* to [...] productive cross-disciplinary communications and collaborations.'

Fatehiboroujeni, S. (2018).

<https://www.engr.colostate.edu/me/faculty/dr-soheil-fatehiboroujeni/>

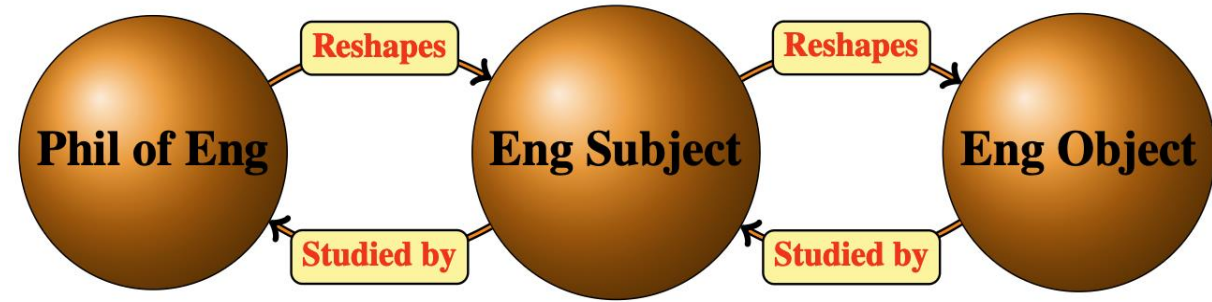


Figure 1: Reciprocal relationship between the object of engineering knowledge (Eng Object) and first-order knowledge of engineering (Eng Subject), as well as the similar relationship between the second-order knowledge of engineering (Phil of Eng) and engineering subject is illustrated graphically.

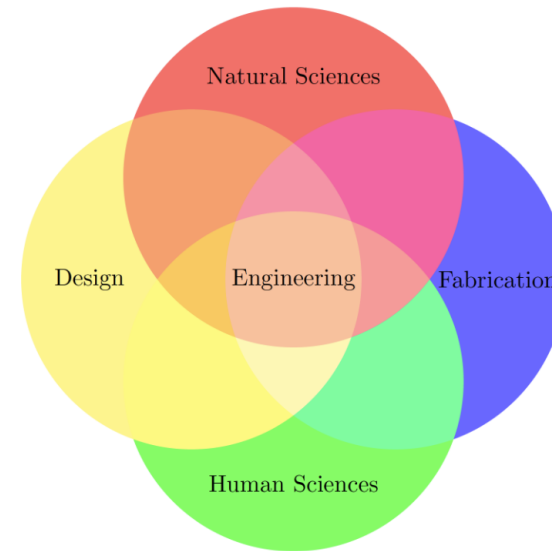


Figure 3: Four constituents or dimensions of engineering knowledge, namely, natural sciences, human sciences, design, and fabrication are represented with circles. The conjunction of the four can be regarded as the space of engineering knowledge.

*Image credits:*  
Fatehiboroujeni, S. (2018, June), *On Epistemic Diversity of Engineering and Engineering Education*. Paper presented at 2018 ASEE Annual Conference & Exposition, 24-27 June 2018, Salt Lake City, Utah. US.  
DOI: [10.18260/1-2-30847](https://doi.org/10.18260/1-2-30847) [accessed 17 March 2025].

# Non-acoustic Factors

**Significantly impact human health, mental health and wellbeing affecting project outcomes.**

**The WHO Environmental Noise Guidelines (2018) confirmed that non-acoustic factors (NAFs):**

- are *‘important possible confounder[s] in both exposure-response functions (ERFs) between noise levels and critical health effects and the effects of acoustic interventions on health outcomes’*
- may include attitude to the noise source, attitude to/trust of the noise maker/authority and ability to cope with noise (Guski, R., 1999; Schreckenberg, D., 2022)
- may account for *‘up to 33% of the variance’* in noise annoyance studies (Guski, R., 1999)

WHO (2018). "Environmental Noise Guidelines for the European Region." Retrieved 8 September 2024, from <https://iris.who.int/bitstream/handle/10665/279952/9789289053563-eng.pdf?sequence=1>.

Further reading regarding the ISO standard on non-acoustic factors see: Woodland, L., *et al.* 2024. Development of a conceptual framework for a new international standard on non-acoustic factors. *In Proceedings of Inter-Noise 2024, Nantes, France, 25-29 August 2024*. [https://doi.org/10.3397/IN\\_2024\\_4068](https://doi.org/10.3397/IN_2024_4068)



# Final thoughts

- How can the NN+ project build on existing best practice and the stated aims to *stretch even further beyond the current state of the art* via:
  - Cognitive and philosophical epistemologically diverse frames
  - Is *already an intrinsic aim* of NN+ – is going further feasible?
- To (even) better account for the human experience (NAFs) to improve health, mental health and wellbeing.
- To support/develop new pedagogies and the next generation of engineers.



# Thank you

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