Data architecture comparison table

Criteria	Knowledge graph (KG)	Vector database (VDB)	KG with vector search
Complex queries & completeness	Excels in complex engineering queries with precise, complete responses. Effective in inferring answers not explicitly in the data such as: *"How many projects in London between 2016-2020 used post-tensioned concrete slabs?"*	Effective for smaller databases and with fine-tuned models, offers good performance for domain-specific queries.	Very effective – vector search as well as keyword search is used to find relevant nodes (or intersections) and graph search is used to find relevant information connected to these nodes.
Credibility & error correction	Highly accurate with clear paths to correct errors, crucial in technical fields.	Potentially inaccurate in engineering contexts, with limited error correction capabilities.	Merges KG accuracy with vector inference, but can struggle to find relevant graph entry points using embedding search only.
Implementation in engineering	Requires extensive validation, ideal for structured data and converting unstructured data with well-defined frameworks. Scales well though needs specialists or finetuned LLMs for advanced querying.	Relatively easier for general engineering data, but may lack depth for complex datasets. Doesn't scale as well to large databases.	Complex due to managing graph structures and vector embeddings. Embeddings can be added later to existing KGs.
Data handling & domain specificity	Ideal for structured and unstructured civil engineering data, maintaining project-specific integrity.	More suited for handling unstructured data like reports or design narratives in engineering.	Provides flexibility in handling diverse data types, beneficial for various engineering applications.
Scalability & machine learning integration	Highly scalable though careful framework design and validation needed, adaptable for diverse engineering projects.	Scalable when using metadata to reduce search areas through filtering, otherwise difficult to obtain correct knowledge with large datasets.	Scales like a knowledge graph and due to the other forms of search available can work at very large size.

Explainability in engineering	Highly explainable, providing clarity in decision-making processes for complex engineering projects.	Focused on semantic analysis, less precise for technical jargon, impacting explainability.	Combines transparency of how knowledge is represented with semantic analysis, requires comprehensive application layer to access the knowledge to harness full power of the system.
Overall suitability for civil engineering	Best for deep, structured understanding and inferring insights from unstructured data, ideal for project planning and compliance.	Suitable for summarising large volumes of textual data, offering quick insights for engineering projects.	Offers a hybrid approach, catering to structured knowledge depth and broad semantic analysis capabilities.