What HEOR Can Learn from Mature AI Industries and Where the Analogies Break Down

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KEY MESSAGE

Mature AI industries offer HEOR a governance playbook, not a technical one. AI governance in HEOR should be borrowed from banking and insurance, not aviation or manufacturing. The difference is uncertainty: HEOR demands oversight built for evolving evidence, not stable systems.

BACKGROUND

In mature artificial intelligence (AI) sectors, governance frameworks have increasingly shifted from viewing model quality as a purely technical issue to treating it as an enterprise risk and accountability problem, with formal expectations for documentation, validation, challenge, and escalation proportional to decision consequence

This is especially relevant to HEOR because AI-enabled analyses may influence:

- Reimbursement recommendations & pricing discussions
- Formulary placement & managed access conditions
- Evidence-generation priorities

HEOR differs from operational AI domains as outputs rest on heterogeneous real-world data, explicit structural assumptions, and probabilistic forecasts rather than closed-loop control in stable environments.

OBJECTIVES

1. Identify which governance, validation, and oversight approaches from high-stakes industries translate effectively to HEOR
2. Determine which approaches require adaptation for HEOR-specific constraints
3. Establish which are fundamentally misaligned due to differences in data characteristics, uncertainty, and decision permanence
4. Assess whether AI governance systems can sustain trust as data sources, assumptions, comparators, and payer evidentiary expectations evolve

Five Governance Dimensions Assessed

1	Model risk stratification
2	Validation & recalibration standards
3	Human oversight models
4	Auditability & traceability requirements
5	Accountability for downstream decision consequences

HEOR-SPECIFIC CONSTRAINTS

- Heterogeneous and incomplete real-world data
- Probabilistic causal inference and forecasting
- Evolving evidence bases over time
- Health technology assessment (HTA) and payer decision frameworks
- Non-linear, stochastic disease progression
- Assumptions of stable data-generating processes, immediate feedback, or deterministic thresholds often weak or absent in HEOR

METHODS

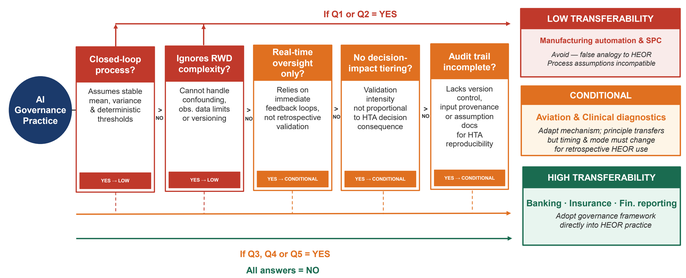
Structured Comparative Analysis

A structured comparative analysis was conducted across six AI-mature industries, assessed against five governance dimensions and evaluated against HEOR-specific constraints including heterogeneous real-world data, probabilistic causal inference, evolving evidence bases, and HTA/payer decision frameworks.

Six AI-Mature Industries Examined

- Banking
- Insurance
- Aviation
- Financial Reporting
- Advanced Manufacturing
- Clinical Diagnostics

Fig 1: AI Governance Decision Flow for HEOR Transferability



Evaluation is cumulative: ALL questions assessed | First LOW flag takes priority over CONDITIONAL

Key Analytical Focus

The comparator standard was whether external industry assurance mechanisms could accommodate:

- Observational data limitations & residual confounding
- Model uncertainty & version changes
- Evidence updates over time
- Assumptions of stable data-generating processes
- Whether validation expectations assumed immediate feedback loops or deterministic thresholds

DISCUSSION

Effective translation requires reframing AI assurance around decision impact, explicit uncertainty, and sustained oversight, positioning AI as an embedded component of governance-enabled analytic practice rather than a standalone technical solution.

For HEOR, this implies prioritizing:

- Proportional governance frameworks
- Transparent documentation practices
- Independent review mechanisms
- Periodic reassessment as evidence matures

Avoiding false analogies to operational settings where system stability, immediate feedback, or deterministic control limits make automation more defensible.

RESULTS

Three Patterns of Transferability Identified

HIGH Transferability	CONDITIONAL Transferability	LOW Transferability
Eg: Banking & Insurance	Eg: Aviation & Clinical Diagnostics	Eg: Manufacturing Automation

✓ High Transferability

Banking: Formal model inventories, independent validation, conceptual soundness review, outcome analysis, and ongoing monitoring : directly adaptable for high-consequence HTA submissions or internal portfolio decisions.
Insurance: Use-case impact assessment, proportional controls, fairness, documentation, and accountability support risk-tiered HEOR governance rather than one-size-fits-all validation.
Finance-grade auditability: Sufficient audit documentation to allow an experienced reviewer to understand work performed, evidence obtained, and conclusions reached : directly parallels HEOR good-practice guidance on transparent model structure, input provenance, validation history, and reproducibility. [1,2]

⚠ Conditional Transferability

Aviation & clinical diagnostics emphasize real-time intervention. HEOR requires retrospective oversight focused on bias detection, assumption validation, and longitudinal consistency as evidence evolves.[3]

Clinical decision support principles translate well when AI supports evidence synthesis, parameter selection, or scenario generation, though timing and mode of intervention differ substantially.

✗ Low Transferability

Manufacturing-style automation and statistical process control (SPC), which depend on stable, repeatable systems conflict with the non-linear, stochastic nature of disease progression and economic modelling. [4]

Uncertainty in HEOR is not merely noise around a fixed process but a substantive feature of the causal and economic question itself.

CONCLUSIONS

Effective translation requires reframing AI assurance around:

- Decision impact proportionality
- Explicit uncertainty characterization
- Sustained oversight over time
- Independent review and periodic reassessment.

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