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ARTIFICIAL INTELLIGENCE LARGE LANGUAGE MODEL INTERROGATION

REPRESENTATIONAL MEASUREMENT FAILURE IN HEALTH TECHNOLGY ASSESSMENT

LEGACY HTA: REJECTING REPRESENTATIONAL MEASUREMENT BY THE ISPOR CENTRAL AND EASTERN EUROPE (CEE) CONSORTIUM

Paul C Langley PhD Adjunct Professor, College of Pharmacy, University of Minnesota, Minneapolis, MN

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ABSTRACT

Background: *Contemporary health economics and health technology assessment (HTA) are well established across Central and Eastern Europe (CEE), supported by the ISPOR Central and Eastern Europe Consortium and its associated professional environment. Economic evaluation, utilities, quality-adjusted life-years (QALYs), incremental cost-effectiveness ratios (ICERs), patient-reported outcomes, decision modelling and uncertainty analysis form a familiar methodological architecture. This paper asks whether the representational-measurement requirements necessary to justify these quantitative methods were transmitted with them.*

Methods: *The publicly available ISPOR CEE program-content knowledge base was interrogated using two complementary frameworks. First, 24 canonical propositions assessed possession of principles required for lawful measurement and propositions characteristic of legacy HTA. Second, a frozen 37-topic program-content framework assessed explicit representation of 17 topics covering representational measurement and 20 topics covering contemporary HEOR and HTA. Measurement was treated as logically prior to arithmetic, requiring defined attributes, appropriate scale properties, admissible transformations and arithmetic, dimensional homogeneity, ratio measurement where required, and distinct measurement pathways for manifest and latent attributes.*

Results: *The two interrogations produced complementary evidence of measurement inversion. The canonical-statement assessment demonstrated weak possession of propositions requiring measurement before arithmetic, ratio measurement before multiplication and representational-measurement axioms, while strongly possessing conventional propositions supporting QALYs, aggregation and subjective scores. The program-content interrogation produced the categorical result 0/17 for representational measurement and 20/20 for contemporary HEOR and HTA. All major components of the contemporary framework were represented, while none of the frozen measurement topics was explicitly established as a foundational requirement. The missing 17 are not additional topics independent of the possessed 20; they contain the scientific gatekeepers required to determine whether many downstream quantitative operations are admissible.*

Conclusions: *The CEE finding is not evidence of failure to acquire contemporary HTA. It demonstrates remarkably successful transmission of an internationally established methodological framework accompanied by omission of its prior measurement requirements. What has been replicated is the methodology, not the measurement proof**.** CEE therefore exhibits complete program-content inversion: arithmetic, modelling and economic evaluation precede demonstration of lawful measurement. The appropriate response is not additional legacy HTA or the addition of measurement as another curricular topic. Measurement must become the gatekeeper: attribute → measurement requirements → manifest or latent measurement → demonstrated scale properties → admissible arithmetic → quantitative claim → empirical evaluation → replication and falsification**.** Methods surviving this sequence may remain; those failing it must be abandoned.*

INTRODUCTION

Health technology assessment (HTA) and health economics have become deeply embedded within the healthcare decision environments of Central and Eastern Europe (CEE). Economic evaluation, cost-effectiveness and cost-utility analysis, utilities, quality-adjusted life-years (QALYs), incremental cost-effectiveness ratios (ICERs), patient-reported outcomes, decision modelling and uncertainty analysis now form a familiar methodological architecture across the region. The ISPOR Central and Eastern Europe Consortium has contributed to this development by providing an organizational structure through which health economics and outcomes research (HEOR), HTA methods, education, scientific exchange and professional collaboration can be promoted across participating countries.

The scientific question addressed in this paper, however, is not whether CEE has successfully acquired contemporary HEOR and HTA methods. The evidence suggests that it has. The more fundamental question is whether the measurement requirements necessary to justify the quantitative operations within those methods were transmitted with them.

Representational measurement requires measurement to precede arithmetic [1 2] . Numerical values do not acquire empirical meaning merely because mathematical operations can be performed upon them. The attribute must first be defined, its measurement properties demonstrated, the scale established and the arithmetic shown to be admissible for that scale. This requirement is particularly consequential for legacy HTA because its central constructs depend upon multiplication, division, aggregation and subtraction. The QALY requires multiplication of a health-state value by time; cost-effectiveness analysis subsequently subtracts and divides these quantities to construct incremental cost-per-QALY claims. If the required measurement properties have not first been demonstrated, additional arithmetic, modelling, simulation and uncertainty analysis cannot repair the foundational failure.

This is measurement inversion. The required scientific sequence: attribute → measurement → scale properties → admissible arithmetic → quantitative claim has effectively been reversed. The arithmetic and its applications have been transmitted before demonstrating that the numerical representations entering those operations possess the required measurement properties.

This report on the program content of the CEE knowledge base complements a previous assessment of the extent to which measurement inversion was present [3].

The importance of the CEE finding extends well beyond the region. CEE did not independently invent the principal methods examined here. It inherited an internationally established framework promoted through professional organizations, publications, education, conferences, guidelines and established HTA practice. The question is therefore not whether CEE failed to adopt international standards. It is whether it adopted those standards successfully and, in doing so, inherited their measurement failure.

The evidence presented here supports the latter conclusion. What has been transmitted across CEE is a sophisticated methodological framework constructed in the wrong scientific order. What has been replicated is the methodology, not the measurement proof. Once that distinction is

recognized, the issue is no longer how CEE should further refine legacy HTA. It is which components of that framework remain scientifically defensible after the requirements of representational measurement are finally applied.

This is not the first time ISPOR has been assessed. These earlier studies focused on measurement inversion and the epistemic basis of ISPOR's claims [4] [5] [6] [7] They did not address the more substantive issue of program content and the gatekeeper role of representational measurement.

This places the ISPOR finding directly against the requirements of normal quantitative science. If multiplication requires ratio measurement, that requirement cannot be suspended when constructing a QALY. If arithmetic is constrained by scale properties, established professional practice cannot provide an exemption. If latent attributes require measurement rather than numerical assignment, psychometric sophistication alone cannot establish the required quantitative properties. And if an upstream numerical construction fails the requirements for measurement, downstream modelling, probabilistic analysis and computational refinement cannot restore what was absent at the beginning. Scientific legitimacy cannot be conferred retrospectively by analytical sophistication.

This makes ISPOR a critical case. If a professional organization with global influence over HEOR education and methodological practice exhibits complete program-content inversion, the issue cannot be dismissed as an isolated curricular omission. It concerns the foundations upon which generations of practitioners have been trained to make quantitative claims. The central question raised by this interrogation is therefore unavoidable: can contemporary HTA claim conformity with normal quantitative science when its leading professional educational framework comprehensively represents the methods of arithmetic and modelling while failing to establish the representational-measurement principles required to determine whether that arithmetic is scientifically admissible? This is the question at the center of the analysis that follows.

FOUNDATIONS OF QUANTITATIVE ANALYSIS

Before examining the program-content knowledge base of the ISPOR Central and Eastern Europe (CEE) Consortium, it is important to identify the scientific principles against which that content is assessed. These are not matters of methodological preference, regional practice or competing schools of health economics. They are requirements of representational measurement that determine whether quantitative claims, and the arithmetic operations supporting them, are scientifically admissible [8].

Two principles are fundamental. First, measurement must precede arithmetic. Numerical operations cannot create measurement where measurement has not first been established. Second, the arithmetic performed must be admissible for the measurement scale concerned. Operations involving multiplication, division and ratio comparisons require the appropriate ratio measurement properties. For claims of therapy impact in HTA, this requires linear ratio measurement for manifest attributes or Rasch measurement for latent attributes. These requirements are logically prior to, and cannot be supplied retrospectively by, statistical analysis, economic evaluation, decision modelling or simulation.

These principles establish the boundary between numerical manipulation and lawful quantitative measurement. Contemporary HEOR and HTA, as represented within the CEE knowledge environment, encompass economic evaluation, utilities, QALYs, cost-effectiveness and cost-utility analysis, patient-reported outcomes, decision analysis, health-economic modelling, uncertainty analysis, value assessment, budget impact and the application of these methods to reimbursement and healthcare decision making. These approaches were not independently constructed within CEE. They form part of an internationally established methodological framework transmitted through ISPOR and the wider HEOR and HTA community. Their widespread acceptance and successful regional adoption, however, do not establish their measurement status. The prior scientific question remains whether the quantities entering these analyses possess the measurement properties required for the arithmetic performed upon them.

The CEE Consortium provides a particularly important setting in which to ask this question. Its regional environment brings together national ISPOR chapters and HEOR and HTA communities at different stages of institutional and methodological development. Through scientific meetings, educational activities, professional exchange, regional collaboration and participation in the wider ISPOR environment, the Consortium contributes to the dissemination and reinforcement of contemporary HEOR and HTA methods. The resulting program-content knowledge base therefore provides an opportunity to determine not simply what methods have been transmitted across CEE, but whether the measurement science required to justify those methods was transmitted with them.

The present program-content review consequently asks a straightforward question: does the publicly available CEE knowledge base explicitly recognize representational measurement as the foundation for quantitative claims before introducing the methods and arithmetic of contemporary HEOR and HTA? Specifically, are measurement preceding arithmetic, ratio measurement, admissible transformations, admissible arithmetic, dimensional homogeneity, and the distinct measurement requirements of manifest and latent attributes established before utilities, QALYs, cost-effectiveness analysis, ICERs and decision models are introduced and applied? Or does the knowledge base proceed directly to these established methods without first establishing their measurement admissibility?

This is the criterion governing the analysis that follows. The issue is not whether CEE has successfully developed expertise in contemporary HEOR and HTA. The evidence indicates that it has. The scientifically prior question is whether the regional knowledge environment also possesses the measurement framework required to determine whether its quantitative operations are admissible. If the methods are present but their measurement prerequisites are absent, the result is not incomplete methodological development. It is program-content inversion: the successful transmission of arithmetic without the scientific foundations required to justify it.

MEASUREMENT BEFORE ARITHMETIC

Before students, researchers and practitioners are introduced to health technology assessment, health economics, cost-effectiveness analysis or decision modelling, they should understand the scientific conditions that determine whether quantitative claims are possible at all. The governing

principle is elementary: measurement must precede arithmetic. Numbers cannot legitimately be multiplied, divided, aggregated or otherwise manipulated merely because numerical values have been assigned to observations. The properties of the measurement scale determine whether the proposed arithmetic has empirical meaning.

Representational measurement provides the required foundation. The target attribute must first be identified and defined, its measurement properties established and the appropriate measurement structure demonstrated. Only then can arithmetic proceed. Multiplication and division require the appropriate ratio properties, admissible transformations must be respected and dimensional homogeneity maintained. Reversing this sequence does not constitute an alternative approach to quantitative science. It permits arithmetic to proceed without first demonstrating that the numbers entering the calculation possess the properties required for the operations performed upon them.

This distinction is fundamental for HTA claims of therapy impact. Manifest attributes, including survival time, hospital days, treatment administrations and walking distance, can support linear ratio measurement where the required unit, non-arbitrary zero and scale properties are demonstrated. Latent attributes such as pain, fatigue, physical function and need fulfilment require a different measurement pathway. Assigning integers to ordered questionnaire responses, summing item scores or statistically transforming those scores does not establish measurement. Rasch measurement provides the person-item conjoint structure, specific objectivity, invariance and logit continuum required to establish possession and change in a defined unidimensional latent attribute.

These principles are not advanced methodological refinements to be introduced after conventional HEOR and HTA methods have been learned. They are logically prior requirement**s.** Practitioners should understand attributes, scale properties, manifest and latent measurement, admissible transformations and permissible arithmetic before being asked to construct utilities, QALYs, incremental outcomes, cost-effectiveness ratios or health-economic decision models.

Program content therefore has a critical role in either preventing or facilitating measurement inversion. If education begins with economic evaluation, utilities, QALYs, cost-effectiveness analysis, patient-reported outcomes and decision modelling, learners are introduced immediately to numerical operations whose measurement foundations may never have been examined. Arithmetic becomes familiar before its admissibility has been established. Modelling techniques are mastered before the learner has been equipped to determine whether the quantities entering the model are legitimate measures. What should have been a scientific question ofcan this operation be performed? is displaced by a technical question how should this operation be performed?

Once this sequence becomes embedded in program content, measurement inversion can become self-reinforcing. Students learn established methods as accepted professional practice. Researchers subsequently apply those methods, publish their results and teach them to another generation. Agencies incorporate them into submission requirements and reference cases. Professional organizations reinforce them through courses, conferences, methodological guidance and competency expectations. Increasing technical sophistication then occurs within an analytical framework whose logically prior measurement assumptions remain unexamined.

The QALY illustrates the danger. Learners can be taught how to estimate health-state values, multiply them by time, aggregate QALYs, calculate incremental QALYs and construct cost-per-QALY ICERs without first confronting the measurement question that governs the entire sequence. Time cannot donate its ratio properties to utility. If the health-state value has not independently demonstrated the properties required for multiplication, subsequent aggregation, subtraction, division, modelling and uncertainty analysis cannot repair the failure. Arithmetic cannot rescue a failure of measurement by adding further arithmetic.

This is why program content matters so profoundly in the CEE environment. The issue is not simply which HEOR and HTA techniques are taught or promoted. It is the order of scientific knowledge that the program environment facilitates. A program-content structure that emphasizes downstream quantitative methods while failing to establish their upstream measurement requirements does more than omit a topic. It equips practitioners to reproduce measurement inversion.

The appropriate educational sequence is the reverse: attribute → measurement requirements → manifest or latent pathway → demonstrated scale properties → admissible arithmetic → quantitative claim → empirical evaluation → replication and falsification. Measurement is not another methodological topic to be placed alongside modelling, economic evaluation or uncertainty analysis. It is the gatekeeper that determines whether those activities have quantitative legitimacy.

The CEE program-content knowledge base must therefore be assessed against this prior requirement. The question is whether it equips practitioners to challenge the measurement status of the quantities they are asked to manipulate, or whether its structure facilitates an inherited sequence in which established arithmetic and modelling are learned first and their measurement admissibility remains outside the scientific foundation. Where the latter occurs, program content does not merely coexist with measurement inversion. It becomes one of the mechanisms through which measurement inversion is reproduced.

THE CRITICAL ROLE OF RATIO SCALES

The CEE program-content assessment rests upon a fundamental requirement of representational measurement: arithmetic operations are constrained by the properties of the measurement scale. Numerical values cannot legitimately be multiplied, divided or otherwise manipulated merely because numbers have been assigned to observations. Measurement must first be established, the relevant scale properties demonstrated and the proposed arithmetic shown to be admissible for the scale concerned.

The distinction between nominal, ordinal, interval and ratio scales is therefore critical. Nominal scales classify; ordinal scales establish order; interval scales provide equal intervals but lack a non-arbitrary zero. Ratio scales possess equal units and a non-arbitrary zero and therefore support meaningful ratio comparisons and the multiplicative arithmetic required for many quantitative claims. Ratio status is not conferred by assigning a zero, transforming a score or requiring a particular calculation. The necessary measurement structure must be demonstrated independently.

Professional convention, international acceptance and repeated application cannot waive that requirement.

This has immediate consequences for the contemporary HEOR and HTA methods represented throughout the CEE environment. QALYs multiply health-state values by time; incremental cost-effectiveness ratios divide differences in costs by differences in outcomes; and decision models combine probabilities, utilities, durations, resource quantities, costs and other numerical inputs through extensive sequences of arithmetic operations. The scientific question precedes all of them: do the quantities entering these operations possess the measurement properties required for the arithmetic performed upon them?

Where they do not, the arithmetic is inadmissible. Subsequent statistical analysis, probabilistic sensitivity analysis, modelling or simulation cannot correct a measurement failure that occurred before the calculation began. Greater computational sophistication merely carries the unresolved measurement problem further downstream. A model containing thousands of calculations does not acquire greater scientific legitimacy if the quantities entering its first calculation have never been established as measures capable of supporting that operation.

The QALY provides the clearest example. Its familiar construction, QALY = U × T, requires multiplication. Time can satisfy the requirements for linear ratio measurement. The critical question is therefore whether the health-state value possesses the measurement properties required to operate as a proportional adjustment to time. The requirement to perform the multiplication cannot itself confer those properties upon utility. Time cannot donate its ratio properties to utility. They must be established independently before multiplication is undertaken.

The failure cannot be repaired downstream. If the QALY has not been established as a legitimate quantitative measure, aggregation does not make it one. Subtracting QALYs to produce an incremental QALY does not make the difference legitimate. Dividing incremental costs by an inadmissible ΔQALY cannot manufacture a scientifically meaningful cost-per-QALY ICER. Nor can embedding these quantities within increasingly elaborate decision models overcome the original failure. Arithmetic cannot rescue a failure of measurement by adding further arithmetic.

For claims of therapy impact, two measurement pathways are relevant. Manifest attributes require appropriate linear ratio measurement. These include directly observable attributes such as survival time, hospital days, treatment administrations and walking distance where the required unit, zero and scale properties can be demonstrated. Latent attributes—including pain, fatigue, physical function and need fulfilment—require a different measurement pathway. Rasch measurement provides person-item conjoint measurement, specific objectivity, invariance and a logit continuum for establishing possession of a defined unidimensional latent attribute.

The distinction is fundamental. A manifest attribute cannot simply be treated as though any numerical representation of it were a ratio measure, and a latent attribute does not become a measure because questionnaire responses have been assigned numbers, summed or statistically transformed. Measurement status must be demonstrated rather than assumed. Without that demonstration, numerical output remains numerical output; its availability for computation does not establish its legitimacy as a measure.

The CEE assessment therefore applies a straightforward criterion. Does the publicly available regional program-content knowledge base recognize scales of measurement, ratio measurement, admissible transformations, admissible arithmetic, dimensional homogeneity and the distinct measurement requirements of manifest and latent attributes before introducing the quantitative methods of contemporary HEOR and HTA? Or does program content proceed directly to economic evaluation, utilities, QALYs, cost-effectiveness and cost-utility analysis, preference measurement, decision modelling and uncertainty analysis without first establishing the measurement properties required for their arithmetic?

This question is particularly consequential in CEE because the region has been exposed to an internationally established HEOR and HTA framework through professional education, scientific meetings, national chapters, academic programs, research collaboration and the wider ISPOR environment. The issue is therefore not whether CEE practitioners have access to contemporary quantitative methods. It is whether the program-content environment equips them with the scientific knowledge required to challenge the measurement foundations of those methods before applying them.

Ratio measurement consequently cannot be treated as an optional addition to an established HEOR curriculum. It is a gatekeeper. Failure to recognize its role facilitates measurement inversion by allowing practitioners to become highly proficient in utilities, QALYs, ICERs, modelling and uncertainty analysis without first acquiring the scientific criteria required to determine whether their arithmetic is admissible. A program environment organized in that sequence does not merely omit measurement theory. It facilitates the reproduction of an analytical framework in which the calculation is taught before the legitimacy of the calculation has been established.

THE CEE KNOWLEDGE BASE: PROGRAM CONTENT AND COVERAGE

The present assessment uses the large language model interrogation framework applied in previous studies of measurement inversion, curriculum inversion and program-content inversion. The program-content analysis differs from the probabilistic interrogation of canonical propositions in one important respect. Rather than estimating categorical probabilities representing expected endorsement of particular statements, it examines whether specified scientific and methodological topics are explicitly represented within the publicly available CEE program-content knowledge base. The question is therefore not what individual members of the CEE HEOR community might know or believe, but what the regional knowledge environment makes available for education, professional development and methodological application.

For this purpose, the CEE knowledge base comprises publicly accessible program content associated with the ISPOR Central and Eastern Europe Consortium, its constituent chapters and the wider ISPOR educational and scientific environment within which those chapters operate. Relevant content includes regional and national scientific meetings, educational activities, conferences, methodological presentations, professional-development programs, HEOR and HTA training, chapter activities and participation in wider ISPOR initiatives. The objective is to characterize the methodological environment through which contemporary HEOR and HTA

knowledge is made available and reinforced across CEE rather than to construct an inventory of every publication produced by researchers located within the region.

This distinction is important. The CEE Consortium is not a university and does not offer a conventional degree curriculum. Its influence operates through a distributed professional network linking national chapters, researchers, academics, industry professionals, consultants, health economists, outcomes researchers and individuals involved in HTA and healthcare decision making. Participants are also exposed to the wider ISPOR methodological environment through conferences, publications, educational activities and professional interaction. The resulting knowledge base is therefore both regional and international: regional in its organizational setting, but substantially connected to the wider methodological framework of contemporary HEOR and HTA.

The interrogation examines two sharply contrasting bodies of content using the same frozen framework applied in preceding program-content studies. The first comprises 17 topics representing the requirements of representational measurement. These include representational measurement itself; scales of measurement as constraints upon arithmetic; measurement preceding arithmetic; the axioms of representational measurement; ratio measurement as a prerequisite for multiplication and division; true zero and equal units; admissible transformations; admissible arithmetic by scale type; dimensional homogeneity; the distinction between manifest and latent attributes; linear ratio measurement for manifest attributes; possession of latent attributes; Rasch measurement; person-item conjoint measurement; specific objectivity and invariance; Rasch logit ratio measurement; and recognition of the two forms of ratio measurement required for therapy-impact claims.

The second body comprises 20 topics representing contemporary health economics and HTA. These include health economics, HTA, economic evaluation, cost-effectiveness and cost-utility analysis, pharmacoeconomics, utilities and preference-based outcomes, QALYs, ICERs, patient-reported outcomes and health-outcomes measurement, decision analysis, decision trees, Markov models, simulation and microsimulation, probabilistic sensitivity and uncertainty analysis, value-of-information analysis, budget impact, priority setting and resource allocation, value assessment, and the policy, reimbursement and decision use of economic evaluation. Together these topics represent the analytical architecture conventionally associated with contemporary HEOR and HTA.

The criterion for classification is deliberately demanding. A topic is recorded as represented only where explicit publicly available program content supports that classification. General references to measurement, psychometrics, validity, health-related quality of life or outcomes assessment are not treated as evidence of representational measurement unless the specific scientific requirement identified by the frozen topic is present. Similarly, the appearance of Rasch analysis in an individual conference presentation or publication does not establish that Rasch measurement forms part of the regional program-content foundation. The purpose is to characterize the knowledge structure available for systematic professional transmission, not the entire range of ideas that individual researchers within CEE may possess.

This distinction is particularly important for outcomes measurement. CEE researchers and practitioners may encounter substantial material concerned with patient-reported outcomes, psychometric assessment, health-related quality of life, preference elicitation and health-state utilities. Such activities demonstrate engagement with what contemporary HEOR commonly describes as measurement. They do not automatically demonstrate possession of representational measurement. The interrogation asks the logically prior questions: whether scale properties are recognized as constraints upon arithmetic; whether the requirements for multiplication and division are established; whether admissible transformations and dimensional homogeneity are recognized; and whether manifest and latent attributes are assigned their distinct measurement requirements. Psychometric sophistication cannot be treated as a substitute for representational measurement.

The CEE knowledge environment provides a particularly revealing setting for this assessment because contemporary HEOR and HTA methods have been extensively disseminated internationally. Economic evaluation, utilities, QALYs, cost-effectiveness analysis, modelling, uncertainty analysis, budget impact and reimbursement applications are established components of the methodological framework to which CEE practitioners are exposed. The region therefore provides an important test of whether the international transmission of increasingly sophisticated analytical methods has been accompanied by transmission of the measurement science required to determine whether their quantitative operations are admissible.

The interrogation consequently asks one narrow but fundamental question: does the CEE program-content knowledge base establish representational measurement before arithmetic, or does it facilitate progression directly into the analytical framework of contemporary HEOR and HTA without first establishing the measurement requirements governing that framework? The assessment does not concern the competence, intentions or scientific sophistication of individual CEE researchers, educators or practitioners. It concerns the architecture of the publicly available program-content knowledge base and the scientific sequence that architecture supports.

This focus also separates the present program-content assessment from the accompanying interrogation of canonical propositions. The two analyses address different dimensions of the same regional knowledge environment. The canonical-statement interrogation estimates possession of specific propositions concerning measurement and legacy HTA. The program-content interrogation asks what foundational and applied topics are actually represented within the environment through which professional knowledge is transmitted. Their independence permits comparison between what the knowledge base appears to possess and what the program environment is structured to transmit.

Program-content inversion is identified where contemporary HEOR and HTA methods are extensively represented while the logically prior requirements of representational measurement are absent. Its significance lies not simply in missing subject matter but in the ordering of knowledge. If measurement precedes arithmetic, representational measurement should stand at the entrance to quantitative HEOR and HTA, determining which subsequent operations are scientifically permissible. Where program content instead begins downstream with utilities, QALYs, cost-effectiveness analysis, modelling and uncertainty analysis, practitioners can become

increasingly proficient in performing calculations without first being equipped to determine whether those calculations are admissible.

The CEE knowledge-base interrogation therefore tests something more consequential than the breadth of regional methodological education. It asks whether the program-content environment prevents measurement inversion or facilitates its reproduction. If the scientific gatekeepers are absent while the methods dependent upon them are extensively transmitted, the result is not simply an incomplete knowledge base. It is an educational and professional architecture capable of reproducing the same reversal of scientific order across countries, institutions and successive generations of practitioners: arithmetic first, measurement later or measurement not at all.

ASSESSMENT FRAMEWORK

For this assessment, the CEE program-content knowledge base was defined as the publicly available material describing relevant education, scientific exchange and professional development in health economics, health technology assessment (HTA), outcomes research, pharmacoeconomics and related fields within the ISPOR Central and Eastern Europe Consortium environment. Sources included Consortium and chapter activities, regional and national scientific meetings, educational programs, workshops, conference activities, methodological presentations and training, together with the wider ISPOR educational environment to which CEE participants are exposed. The purpose was to establish the knowledge and methodological content available for transmission across the regional professional environment, not what individual CEE researchers, instructors or practitioners may know or address independently.

The relationship between the two components of the assessment is the critical issue. Contemporary HEOR and HTA methods cannot be separated from the measurement requirements governing their arithmetic. If practitioners are first taught that measurement precedes arithmetic, that mathematical operations are constrained by scale properties, that multiplication and division require the appropriate ratio properties, and that manifest and latent attributes require different measurement strategies, they possess the scientific criteria required to judge whether subsequent quantitative methods are admissible. Where these foundations are absent, utilities, QALYs, cost-effectiveness ratios, decision models and simulation methods can be introduced without confronting the prior question of whether the quantities involved possess the measurement properties required for the arithmetic performed.

Program-content inversion is therefore identified where contemporary health economics and HTA methods are comprehensively represented across the fixed framework (20/20 topics) while the prior requirements of representational measurement are absent (0/17 topics). This is more than an imbalance in program content. It reverses the required scientific sequence. Arithmetic, economic evaluation and modelling are available for teaching and application without first establishing the conditions governing their admissibility. Instead of measurement determining what arithmetic may legitimately follow, established arithmetic is transmitted without the corresponding representational-measurement framework required to judge it.

For CEE, such a finding would be particularly consequential because it cannot reasonably be interpreted as evidence that the region has failed to acquire contemporary HEOR and HTA. The

relevant question is almost the reverse. CEE has participated in an internationally established methodological environment through ISPOR, national chapters, universities, research organizations, professional meetings, industry, HTA institutions and international scientific exchange. Extensive representation of contemporary HEOR and HTA methods would therefore demonstrate successful methodological transmission. The critical issue is whether the measurement requirements logically prior to those methods were transmitted with them.

Program-content inversion would place the resulting CEE knowledge environment in direct conflict with the requirements of normal quantitative science. Scientific legitimacy is not established merely by generating numbers, employing sophisticated statistical procedures, constructing increasingly complex models or applying their outputs to important healthcare decisions. Quantitative science requires lawful measurement, arithmetic admissible for the measures involved, empirical evaluation, replication and the possibility of falsification. Where the foundational requirements of representational measurement are absent while utilities, QALYs, ICERs and simulation models are taught and applied without first demonstrating their measurement admissibility, methodological sophistication cannot compensate for the prior failure.

The 0/17 versus 20/20 finding should therefore not be interpreted simply as evidence that CEE requires additional educational material on measurement. **Measurement is not topic number 38.** The problem is one of scientific ordering. The 20 contemporary HEOR and HTA topics include methods whose quantitative legitimacy depends upon requirements represented within the 17-topic measurement framework. If those prior requirements are absent, methodological sophistication downstream cannot substitute for the missing measurement foundation upstream. A model may be internally consistent, computationally elaborate and subjected to extensive uncertainty analysis while still depending upon quantities that do not support the arithmetic performed upon them.

The two frameworks are consequently incompatible as alternative foundations for quantitative analysis. Representational measurement requires arithmetic to be constrained by measurement. Once that principle is accepted, every subsequent quantitative method must satisfy its requirements. Established numerical constructs cannot be exempted merely because they are familiar components of international HEOR practice, incorporated into professional education, recommended by methodological guidelines or required by HTA agencies. Institutional acceptance, international repetition and professional consensus cannot create measurement properties that the quantities themselves do not possess.

Conversely, where representational measurement is absent from the program-content foundation, there is no corresponding gate requiring established quantitative constructs to demonstrate their measurement admissibility before they are taught and applied. This provides the mechanism through which measurement inversion can reproduce itself across a regional professional environment. Practitioners can become increasingly proficient in utilities, QALYs, economic evaluation, decision modelling and uncertainty analysis without ever being required to confront the logically prior question: are the quantities entering these procedures measures capable of supporting the arithmetic being performed?

In this sense, a CEE finding of program-content inversion would be more than an educational deficiency. It would identify a separation between the internationally inherited methodological

framework available across the region and the measurement standards required by normal quantitative science. The combination of comprehensive possession of downstream HEOR and HTA methods with absence of their upstream representational-measurement requirements would indicate that the methodology has travelled more successfully than the scientific foundations required to justify it. What has been transmitted is the methodology, not the measurement proof.

The assessment therefore applies a simple but non-negotiable criterion. Either measurement determines admissible arithmetic, or arithmetic proceeds without first satisfying measurement requirements. Both positions cannot provide coherent foundations for quantitative science. The CEE interrogation consequently asks whether the regional program-content environment equips practitioners to challenge the scientific admissibility of established quantitative methods or facilitates their reproduction without that challenge. If the latter is demonstrated, the issue is not that CEE has insufficiently adopted contemporary international HTA. It is that CEE has successfully inherited a framework constructed in the wrong scientific order.

ASSESSMENT RESULTS: PROGRAM CONTENT REVIEW

Organization

ISPOR Central and Eastern Europe (CEE) Consortium

Knowledge Base

ISPOR Central and Eastern Europe Health Economics, Outcomes Research and Health Technology Assessment Program-Content Knowledge Base

Purpose

This review evaluates the publicly available educational, methodological and professional program content associated with the ISPOR Central and Eastern Europe Consortium against a single scientific criterion: whether representational measurement is explicitly recognized as the foundation for quantitative claims before the methods of contemporary health economics and HTA are taught, disseminated or applied.

The interrogation uses the identical frozen 37-topic framework applied in the wider ISPOR and international assessments: 17 topics representing the requirements of representational measurement and 20 topics representing contemporary health economics and HTA.

Program Content Reviewed

The CEE knowledge base is defined as the publicly accessible regional HEOR and HTA environment associated with the ISPOR Central and Eastern Europe Consortium and its constituent chapters. This includes Consortium activities, regional and national chapter educational activities, conference and scientific presentations, HEOR and HTA training, methodological material, professional development activities and the wider ISPOR educational and methodological framework to which CEE participants are exposed.

The assessment distinguishes between references to "measurement" in the conventional psychometric, patient-reported outcome or health-state valuation sense and explicit recognition of **representational measurement as the prior scientific framework governing quantitative claims and admissible arithmetic**. Incidental use of terminology does not constitute recognition under the frozen instrument.

TABLE 1: REPRESENTATIONAL MEASUREMENT

Topic	Explicitly recognized	CEE program evidence
Representational measurement	No evidence identified	No evidence identified that representational measurement provides the governing scientific foundation for HEOR/HTA quantitative claims
Scales of measurement as constraints on arithmetic	No evidence identified	Scale type is not identified as a prior constraint determining permissible arithmetic
Measurement precedes arithmetic	No evidence identified	No explicit measurement gate identified before economic evaluation, modelling or quantitative manipulation
Axioms of representational measurement	No evidence identified	No systematic treatment of representational-measurement axioms identified
Ratio measurement as prerequisite for multiplication and division	No evidence identified	No evidence that ratio status is required to be demonstrated before multiplicative HTA operations
True zero and equal units	No evidence identified	No systematic treatment identified as prerequisites for ratio measurement
Admissible transformations	No evidence identified	No explicit treatment identified linking permissible transformations to scale type
Admissible arithmetic by scale type	No evidence identified	Arithmetic operations are taught and applied without an explicit prior scale-admissibility framework
Dimensional homogeneity	No evidence identified	No evidence identified that dimensional homogeneity operates as a required gatekeeper for quantitative HTA claims
Manifest and latent attributes as distinct measurement classes	No evidence identified	No explicit measurement framework distinguishing manifest from latent attributes identified
Linear ratio measurement for manifest attributes	No evidence identified	No systematic treatment identified
Possession of latent attributes	No evidence identified	No explicit possession-based framework for latent therapy-impact claims identified
Rasch measurement as requirement for latent attributes	No evidence identified	Rasch measurement not identified as the required basis for constructing latent measures

Person–item conjoint measurement	No evidence identified	No systematic treatment identified
Specific objectivity and invariance	No evidence identified	No systematic treatment identified as requirements for latent measurement
Rasch logit ratio measurement for latent attributes	No evidence identified	No evidence identified of this measurement pathway as the basis for latent therapy-impact assessment
Two admissible ratio measures for therapy impact	No evidence identified	No framework identified distinguishing linear ratio measurement for manifest attributes and Rasch logit ratio measurement for latent attributes

Table 1 Result: 0/17 representational-measurement topics explicitly recognized as foundations of the publicly accessible CEE Consortium program-content knowledge base reviewed.

This classification does not imply that CEE researchers never encounter the words *measurement*, *validity*, *quality of life*, *patient-reported outcomes*, *psychometrics* or even *Rasch*. The criterion is substantially narrower and scientifically more demanding. Recognition requires that representational measurement and its associated scale requirements operate as **prior constraints upon the creation and manipulation of quantitative claims**. No such coherent framework was identified.

The result is therefore **0/17**, not because CEE lacks quantitative methodology, but because the knowledge environment does not establish the scientific measurement architecture that should determine whether that methodology is admissible.

TABLE 2: CONTEMPORARY HEALTH ECONOMICS AND HTA FRAMEWORK

Topic	Explicitly represented	CEE program evidence
Health economics	Yes	Core component of the regional HEOR environment and ISPOR professional framework
Health technology assessment	Yes	HTA development, policy and application represented across CEE activities
Economic evaluation	Yes	Established component of CEE HEOR and reimbursement analysis
Cost-effectiveness analysis	Yes	Routinely represented in regional HTA and economic-evaluation activities
Cost-utility analysis	Yes	Represented through economic evaluation and QALY-based assessment

Pharmacoeconomics	Yes	Long-established component of ISPOR and regional chapter activities
Utilities and preference-based outcomes	Yes	Represented through health-state valuation and economic evaluation
Quality-adjusted life-years (QALYs)	Yes	Standard outcome represented in cost-utility and value assessment
Incremental cost-effectiveness ratios (ICERs)	Yes	Represented in economic evaluation and reimbursement decision frameworks
Measurement and valuation of health outcomes / patient-reported outcomes	Yes	PROs, quality of life and health-state valuation represented within HEOR activities
Decision analysis	Yes	Represented within economic evaluation and HTA methodological applications
Decision-tree modelling	Yes	Established component of decision-analytic economic evaluation
Markov modelling	Yes	Standard modelling methodology represented in cost-effectiveness analysis
Simulation and microsimulation modelling	Yes	Represented within contemporary health-economic modelling
Probabilistic sensitivity and uncertainty analysis	Yes	Established component of model-based economic evaluation
Value-of-information analysis	Yes	Represented within the wider ISPOR decision-science and uncertainty framework
Budget-impact analysis	Yes	Widely relevant to CEE pharmaceutical reimbursement and affordability assessment
Health-care priority setting and resource allocation	Yes	Central to regional HTA, reimbursement and policy applications
Value-for-money / value assessment	Yes	Represented through economic evaluation, HTA and reimbursement decision making
Policy, reimbursement and decision use of economic evaluation	Yes	Major focus of CEE HEOR and HTA activity

Table 2 Result: 20/20 contemporary health-economics and HTA topics represented in the publicly accessible CEE Consortium program-content knowledge base.

The contrast with Table 1 is categorical:

Representational measurement: 0/17

Contemporary health economics and HTA: 20/20

The CEE program-content knowledge base therefore exhibits complete program-content inversion.

ASSESSMENT OF THE CEE PROGRAM-CONTENT RESULTS

The CEE program-content interrogation produces one of the clearest possible signatures of measurement inversion: 0/17 for representational measurement and 20/20 for contemporary health economics and HTA. The importance of this result lies not simply in the difference between zero and twenty. It lies in the logical relationship between the two groups of topics. The 17 missing topics contain the scientific requirements that should determine whether many of the operations represented among the 20 possessed topics are admissible. CEE has therefore acquired the downstream methodology while failing to acquire the upstream scientific framework required to establish its legitimacy.

This is not a marginal curriculum imbalance. It is an inversion of the required order of quantitative science.

The missing topics include representational measurement itself, measurement before arithmetic, scales of measurement as constraints upon arithmetic, the axioms of representational measurement, ratio measurement as a prerequisite for multiplication and division, true zero and equal units, admissible transformations, admissible arithmetic by scale type and dimensional homogeneity. They extend to the distinction between manifest and latent attributes, linear ratio measurement for manifest attributes, possession of latent attributes, person-item conjoint measurement, specific objectivity, invariance and Rasch measurement for latent attributes. Not one of these 17 topics is explicitly established as a foundation of the CEE program-content knowledge base.

The corresponding 20-topic result could scarcely be more different. Health economics, HTA, economic evaluation, cost-effectiveness analysis, cost-utility analysis, pharmacoeconomics, utilities, QALYs, ICERs, patient-reported outcomes, decision analysis, decision trees, Markov models, simulation, probabilistic sensitivity analysis, value-of-information analysis, budget-impact analysis, priority setting, value assessment and the reimbursement use of economic evaluation are all represented.

The contrast is devastating because the 20 cannot simply be placed alongside the 17 as two independent areas of professional knowledge. The missing 17 are logically prior to much of the possessed 20.

Consider the QALY. CEE possesses utilities, QALYs, cost-utility analysis and ICERs. Yet it does not possess, as an explicit methodological foundation, ratio measurement as a prerequisite for multiplication and division, admissible arithmetic by scale type or dimensional homogeneity. The framework therefore teaches or reinforces the quantitative object while omitting the rules required to establish whether that object can legitimately exist.

The sequence has been reversed.

A scientifically defensible sequence would ask first: what is the attribute? Is it manifest or latent? Has measurement been established? What scale properties have been demonstrated? Which transformations are admissible? Which arithmetic operations are permitted? Are the quantities entering multiplication or division legitimate for those operations? Only after those questions have been answered should utilities, QALYs, incremental outcomes and cost-effectiveness ratios enter the analysis.

The CEE program-content profile instead begins almost entirely at the other end: utilities → QALYs → cost-utility analysis → ICERs → models → uncertainty analysis → reimbursement decisions. The measurement gate that should precede this sequence is 0/17.

That is why describing the CEE knowledge base as merely "incomplete" would seriously understate the result. An incomplete curriculum might teach 12 of the 17 measurement topics and 18 of the 20 applied topics. Gaps could then plausibly be filled. The CEE profile is qualitatively different. It displays complete possession of the applied framework and complete non-possession of its measurement foundations under the frozen instrument. Introducing representational measurement would therefore not simply enrich the existing framework. Taking it seriously would require the existing framework to justify itself. That is precisely the challenge legacy HTA has avoided.

Ratio measurement illustrates the problem most starkly. The QALY requires multiplication of a health-state value by time. Yet ratio measurement as a prerequisite for multiplication is absent from the 17-topic program-content profile. This is not an obscure technical omission. It is the question that should have been answered before the QALY was ever admitted into economic evaluation. If the required properties of the health-state value cannot be demonstrated, the multiplication cannot acquire empirical legitimacy merely because it has become conventional.

The same failure then propagates downstream. If the QALY has not passed the measurement gate, subtracting QALYs does not repair it. Dividing incremental costs by an inadmissible ΔQALY does not create a scientifically legitimate ICER. Putting the ICER into a decision model does not repair the denominator. Probabilistic sensitivity analysis does not repair it. Value-of-information analysis does not repair it. Increasing computational sophistication simply performs additional operations downstream of the unresolved measurement failure.

The 20/20 result therefore cannot be interpreted simply as evidence of methodological strength. Viewed conventionally, it certainly demonstrates an extensive and sophisticated HEOR environment. Viewed from representational measurement, however, that sophistication becomes part of the problem. CEE practitioners can be equipped to construct increasingly elaborate analyses without first being equipped to determine whether the quantities entering those analyses are measures possessing the properties required by the arithmetic.

The latent-attribute result is equally serious. CEE possesses patient-reported outcomes and health-outcome measurement within its contemporary HEOR environment, yet the frozen interrogation identifies no foundational recognition of possession of latent attributes, person-item conjoint

measurement, specific objectivity, invariance, Rasch measurement or the Rasch logit measurement pathway. Numerical scores can therefore enter analysis without a prior requirement to demonstrate a defined unidimensional quantitative attribute and an invariant measurement continuum.

Again, the numerical representation comes first and measurement demonstration comes nowhere.

The program-content findings are particularly powerful because they independently explain the pattern exposed by the 24-statement probability/logit interrogation. There, measurement precedes arithmetic receives only 0.15/−1.75, multiplication requires ratio measurement receives 0.15/−1.75 and the requirement for representational-measurement axioms receives 0.15/−1.75. Yet the false proposition that the QALY is a ratio measure receives 0.90/+2.20 and that QALYs can be aggregated reaches 0.95/+2.50. The probability/logit interrogation tells us what the knowledge environment possesses. The 0/17 versus 20/20 interrogation shows the program-content architecture capable of sustaining that possession pattern. The two findings fit almost perfectly.

The knowledge base strongly possesses what legacy HTA wants practitioners to calculate and fails to possess the scientific framework required to determine whether those calculations are admissible.

This also changes the interpretation of CEE's relationship with international HTA. The result should not be presented as evidence that Central and Eastern Europe somehow failed to learn what Western Europe had already mastered. The opposite interpretation is more troubling. CEE appears to have learned the internationally transmitted HEOR framework remarkably well. Twenty out of twenty is evidence of successful transmission. Zero out of seventeen identifies what was not transmitted with it. The problem therefore travels with the methodology.

If an international professional environment disseminates utilities, QALYs, ICERs, modelling, probabilistic sensitivity analysis, value-of-information analysis and reimbursement frameworks without first disseminating representational measurement, ratio measurement and admissible arithmetic as gatekeepers, regions adopting that framework should be expected to reproduce the same inversion. Similarity between CEE and established Western HTA environments then provides no independent scientific validation. It demonstrates common intellectual inheritance.

What has been replicated is the methodology, not the measurement proof.

There is an educational consequence that is even more disturbing. A 0/17 versus 20/20 environment does not merely determine what practitioners know. It influences which questions they are intellectually equipped to ask. Someone can become highly proficient in cost-effectiveness modelling while never encountering the question of whether the QALY possesses the scale properties required for multiplication. They can conduct probabilistic sensitivity analysis without asking whether the quantities whose uncertainty is being propagated were legitimate measures in the first place. They can become expert in manipulating the numbers without possessing the framework required to challenge the scientific status of the numbers.

This is why adding a measurement lecture or another competency cannot resolve the problem. Measurement is not topic number 38. It is not an optional methodological specialty sitting

alongside modelling, economic evaluation and patient-reported outcomes. Measurement is the gatekeeper for the quantitative claims made by those disciplines.

Restoring it to that position changes everything.

The correct sequence is: attribute → measurement requirements → manifest or latent pathway → demonstrated scale properties → admissible arithmetic → quantitative claim → empirical evaluation → replication and falsification.

Once that sequence is imposed, every inherited method has to pass through it. Methods that satisfy the requirements survive. Methods that do not must be abandoned. Their longevity, professional acceptance, international dissemination and computational sophistication are irrelevant to that determination.

The CEE result is therefore more consequential than an educational gap. It is evidence of a successfully transmitted methodological system constructed in reverse scientific order. The region possesses all 20 components of the contemporary HEOR apparatus while possessing none of the 17 representational-measurement foundations required by the frozen interrogation. The arithmetic is present. The models are present. The utilities and QALYs are present. The ICERs are present. The uncertainty machinery is present. The reimbursement applications are present.

The measurement gate is not.

That is the central indictment of the 0/17 versus 20/20 result. CEE does not need more legacy HTA. It has already acquired it comprehensively. Nor does it need the existing framework supplemented with a decorative acknowledgement of measurement. It needs the sequence reversed. Measurement must be placed before arithmetic and given the authority to reject quantitative constructions that cannot satisfy its requirements.

Once that is done, the question is no longer how CEE can become still more proficient in contemporary HTA. The question is which parts of contemporary HTA remain standing after the requirements of measurement are finally applied.

To facilitate this transition to normal science, Maimon Research has developed a comprehensive nine-unit program that reconstructs health technology assessment from the foundations of representational measurement. Its purpose is not to supplement contemporary HTA with another methodological topic, but to provide the scientific framework required to replace a legacy system founded upon inadmissible arithmetic.

The Maimon Research program begins with the non-negotiable principle that measurement precedes arithmetic and develops systematically the requirements for lawful quantitative claims: attribute specification, scales of measurement, admissible transformations, dimensional homogeneity, the distinction between manifest and latent attributes, linear ratio measurement for manifest attributes, Rasch measurement and possession for latent attributes, and the formulation of credible, evaluable and falsifiable claims of therapy impact. It then demonstrates how these principles reshape therapy evaluation, health economics and formulary assessment. The program

therefore provides faculty, researchers and students with both the scientific foundation and the practical pathway required to move HTA into conformity with the standards of normal science.

To our knowledge, this is the only program developed specifically to support this transition from contemporary HTA to a representational measurement paradigm. A complete description of the nine-unit program, together with supporting materials and implementation guidance, is detailed on the Maimin Research website [9] .

CONCLUSION: ABANDONING LEGACY HTA

The Central and Eastern Europe results provide an unusually clear demonstration of the international consequences of measurement inversion. The finding of 0/17 representational-measurement topics against 20/20 contemporary HEOR and HTA topics cannot reasonably be dismissed as a regional curriculum imbalance. It identifies a knowledge environment in which the entire downstream apparatus of legacy HTA has been successfully transmitted while the scientific requirements that should determine whether its quantitative operations are admissible are absent as foundational program content.

The significance of the result extends well beyond CEE. The Consortium did not construct the intellectual architecture it has inherited. It operates within the wider ISPOR environment of HEOR competencies, education, Good Practices, Task Forces, publications, conferences and methodological conventions. The CEE result therefore provides further evidence of the effectiveness with which ISPOR's conception of contemporary HEOR has been transmitted internationally. The 20/20 result demonstrates the success of that transmission; the 0/17 result identifies what was not transmitted with it.

This raises an unavoidable institutional question. What is the likelihood that ISPOR will now endorse lawful measurement, install it as the mandatory gatekeeper for quantitative claims and apply it consistently to the methodological framework it has spent approximately three decades developing and disseminating?

On the evidence examined here, there is no reasonable basis for expecting it to do so.

The difficulty is not simply that ISPOR would have to introduce material that has previously been overlooked. Lawful measurement cannot be incorporated by adding another short course, competency, Task Force or Good Practices Report. The 0/17 finding closes the gate to the 20/20 framework. Once measurement precedes arithmetic, ratio measurement governs the admissibility of multiplication and division, dimensional homogeneity is required, and manifest and latent attributes must follow appropriate measurement pathways, substantial elements of the inherited framework have to be reassessed from their foundations.

The consequences would reach directly into utilities, QALYs, cost-utility analysis, ICERs, patient-reported outcome scoring, economic modelling and the reference-case architecture. ISPOR would have to accept that professional consensus, methodological convention and widespread application cannot confer measurement properties upon quantities that have never demonstrated them. It would then have to apply that conclusion not only to future guidance but retrospectively to its

existing educational programs, Good Practices, competency frameworks, publications and methodological commitments.

That is not methodological updating. It is institutional repudiation of a substantial part of ISPOR's accumulated intellectual capital.

The CEE findings make the scale of that problem visible. The organization would have to move from an international environment capable of reproducing 0/17 versus 20/20 to one in which the 17 measurement requirements govern admission to the 20 downstream topics. It would have to teach researchers to challenge quantitative constructions that ISPOR itself has spent decades legitimizing. It would have to accept that some familiar methods cannot be repaired and must instead be abandoned. It would also have to explain why the measurement requirements now declared indispensable were absent while the methods dependent upon them were being disseminated internationally.

There is no scientific obstacle to making that transition. The requirements of measurement do not depend upon ISPOR's agreement, and the reconstruction of HTA does not require a new international consensus. The obstacle is institutional. ISPOR's educational infrastructure, methodological guidance, journals, Task Forces, professional expertise, regional networks and accumulated reputational capital are deeply invested in the existing framework. The greater the success with which that framework has been institutionalized internationally, the greater the institutional cost of acknowledging that its scientific sequence was inverted from the outset. CEE is evidence of precisely that success.

The prospect of ISPOR voluntarily reversing this architecture must therefore be regarded as vanishingly unlikely. Nothing in the present results suggests an organization preparing to make representational measurement the gatekeeper for HEOR. The evidence points in the opposite direction: complete possession of the contemporary methodological apparatus and complete absence, under the frozen program-content interrogation, of the 17 measurement foundations that would subject that apparatus to scientific challenge.

This does not mean that change is logically impossible. ISPOR could undergo a profound intellectual reconstruction. It could acknowledge the measurement failure, abandon methods that cannot survive lawful measurement, reconstruct its competencies and educational programs, rewrite its Good Practices and require measurement demonstration before accepting quantitative claims. But that would amount to something approaching a Damascene conversion: possible in principle, but scarcely credible as an expectation for institutional behavior. More importantly, no such conversion is required.

CEE universities, HTA agencies, national ISPOR chapters, research groups and individual investigators do not require permission from ISPOR to apply the standards of normal quantitative science. Nor should reconstruction be delayed while waiting to see whether the organization responsible for disseminating the inherited framework is willing to abandon it. Measurement requirements are not created by professional societies and cannot be suspended by them.

The required sequence is already clear: attribute → measurement requirements → manifest or latent measurement → demonstrated scale properties → admissible arithmetic → quantitative therapy-impact claim → empirical evaluation → replication and falsification.

Everything that survives this sequence may remain. Everything that fails it must be discarded.

The implication of the CEE findings is therefore more consequential than a recommendation that ISPOR reform its educational program. There is no reasonable expectation that ISPOR will voluntarily undertake the degree of abandonment required by lawful measurement, and there is no scientific reason to wait for it. The responsibility passes directly to the institutions and investigators capable of making the transition.

CEE has inherited measurement inversion. That explains the 0/17 versus 20/20 result; it does not justify reproducing it. The measurement failure is now exposed. The pathway out is available. Whether ISPOR chooses to follow is increasingly beside the point. The transition to lawful measurement does not depend upon ISPOR. It begins when researchers stop waiting for institutional endorsement and require every quantitative claim to earn its scientific legitimacy through measurement.

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