

Physical Theory of Value: Multi-Core Research Program

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Abstract

This paper presents the structural framework of the Physical Theory of Value (PTV) as a multi-core research program. The work is divided into two main parts: Supporting Foundations (auxiliary papers that provide algorithms, prove efficiency, and establish philosophical basis) and Core Ideas (specific methods for measuring value of particular types). Each Core Idea provides a distinct formula for value computation, grounded in physics, information theory, and semiotics. The framework is designed for modular development, open-source collaboration, and eventual integration into economic and technological systems. This document establishes the foundational framework for subsequent detailed publications and experimental implementations.

Keywords: *Physical Theory of Value, Multi-Core Framework, Value Measurement, Negentropy, Goal-Oriented Systems, Open Source Science, Zenodo phmv*

Part I: Supporting Foundations

These works establish the basis of other researches as Foundations and of the principles of open project development.

Foundation A: Semiotic Axioms

- Axioms of modeling reality...
- Goal Achievement (Multiplicity of technologies for any goal):
For any goal G , there exists at least one pair (E, I) such that $G = E \times I$, and if one pair exists, infinitely many exist.
- $G = E \times I$ (Goal = Energy/Matter $\times$ Information/Technology)

Foundation B: First Law of Nature Semiotics:

First Law of Nature Semiotics: A thinking subject operates not with real objects but with their mental representations encoded in internal language.

- Models vs reality
- Principles of Reality Reflection and Verbal Communication
- Prediction error as inherent property of any languages
- The principle of goal achievement in each model
- The principle of infallibility of each model

Foundation C: Noether's Theorem and Symmetry as Cognitive Construct

- Symmetry as artifact of modeling
- Conservation laws as linguistic constructs

Foundation D: Mathematical Modeling Framework

- Multidimensionality (artificially assigned by researcher)
- Multidimensional Volume

$$V = \prod_{j=1}^d (c_j k_j)$$

- Error tolerance $P_j = 2\varepsilon_j / (\max_j - \min_j)$
- Derivative systems and parametric value

Foundation E: Cosmological Context – Life as Continuation of Universal Evolution

- Internal entropy of space and time
- Life as acceleration toward heat death under non-equilibrium conditions

Foundation F: Semiotic-Teleological Connection – Value and Goal

- Linguistic justification (Russian phonetic correlation: "tsel" – "tsennost")
- Introduction of time dimension into value concept
- Vector model of goals

Note: Some of these foundations have Russian-language versions available. For English translations, readers may use online translation tools or contact the author.

Part II: Core Ideas – Value Measurement Methods

Each Core is an independent method for measuring a specific type of value.

Core I: Technological Value

Idea: Difference between negentropic potential of raw material and finished product.

Formula:

$$V_{tech} = N_{product} - N_{raw} = \sum_j \log_2 \left(\frac{homogeneity_{product}}{homogeneity_{raw}} \right)_j$$

where: N is negentropic potential in bits.

Unit: bits (or J/bit for energy-information equivalent).

Domain: Manufacturing, technology efficiency assessment, quality control.

Core II: Teleological Value

Idea: Degree of approximation of an object to the life goal of its parent system.

Formula:

$$V_{teleo} = \frac{d_{current}}{d_{goal}} \cdot \cos(\theta)$$

where:

$d_{current}$ – current distance to goal

d_{goal} – initial distance

θ – angle between object's evolution vector and system's goal vector

Unit: dimensionless [0,1] or percentage.

Domain: Biology, ecology, social systems, artificial intelligence.

Core III: Relativistic Value

Idea: Relative readiness of an object to perform its function at a given moment.

Formula:

$$V_{rel} = \frac{T_{current}}{T_{max}} \cdot \frac{1}{1 + \epsilon_{context}}$$

where:

T_{current} - current performance/functionality

T_{max} - maximum possible for given object class

$\epsilon_{\text{context}}$ - contextual error (external conditions)

Unit: dimensionless, scalable.

Domain: Engineering, equipment condition assessment, operational readiness.

Core IV: Time-Probability Value

Idea: Time required for raw material to transform into product under given technology.

Formula:

$$V_{tp} = \frac{1}{t_{\text{process}}} \cdot P_{\text{success}}$$

where:

t_{process} - transformation time

P_{success} - probability of successful completion

Unit: - s^{-1} frequency (inverse time) or bits/s.

Domain: Logistics, production cycles, project management.

Core V: Percentage-Goal Value

Idea: Percentage of the final goal achieved by an object that is part of a system.

Formula:

$$V_{\text{pct}} = \frac{C_{\text{current}}}{C_{\text{total}}} \cdot 100\%$$

where:

C_{current} - current contribution to goal achievement

C_{total} - total contribution needed for goal achievement

Examples:

Food for human: $V_{\text{pct}} = (\text{food energy} / \text{daily need}) \cdot 100\%$

Computer power supply: $V_{\text{pct}} = (\text{battery time} / \text{time to task completion}) \cdot 100\%$

Unit: percentage [%].

Domain: Energy, nutrition, resource provision, any system with partial contribution.

Core VI: Negentropic Value (Refined)

Idea: Measure of object's structuredness that reduces costs for goal achievement.

Formula:

$$V_{\text{neg}} = - \sum_j p_j \log_2 p_j \cdot \frac{1}{d_{\text{goal}}}$$

where:

p_j - probabilities of parameter states
 d_{goal} - distance to goal (in SI: bit*Joule units, or other in other measurement systems)
Unit: bits (or bits*J with coefficient).
Domain: Raw material assessment, data quality, system complexity.

Part III: Integrated Computations (Future Chapter)

This section will be developed in subsequent publications.

- Planned content:**
- System of units for PTV (Real Value Unit System - RVUS)
 - Integration of Core values into composite economic value
 - Constants and normalization factors
 - Piecewise integration techniques
 - Case studies and practical implementations

How Cores Use Foundations

Core	Uses Foundations	Output Formula
Core I (Technological)	D (math), F (goal)	$V_{tech} = \Delta N$
Core II (Teleological)	E (cosmology), F (goal)	$V_{teleo} = (d_{current}/d_{goal}) \cos \theta$
Core III (Relativistic)	D (math), B (error)	$V_{rel} = (T_{current}/T_{max})/(1 + \varepsilon)$
Core IV (Time-Probability)	D (volume), B (error)	$V_{tp} = (1/t) \cdot P$
Core V (Percentage-Goal)	F (goal), C (symmetry)	$V_{pct} = (C_{current}/C_{total}) \cdot 100\%$
Core VI (Negentropic)	D (math), E (entropy)	$V_{neg} = -\sum p_j \log_2 p_j / d_{goal}$

Conclusion

This document outlines the structural skeleton of the **Physical Theory of Value** multi-core research program. Six Supporting Foundations provide the theoretical basis, while six Core Ideas offer distinct, computable value types for various domains. The framework is intentionally modular, allowing independent development of each Core and future addition of new Cores. Integrated computations combining multiple Cores into composite economic value will be addressed in subsequent publications.

All materials are open source and available for collaboration. Researchers interested in developing any Core further or proposing new Cores are welcome to contact the author.

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Project Hub:

https://www.researchgate.net/publication/398889201_A_Physical_Theory_of_Value_An_Axiomatic_Framework_and_Research_Program

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