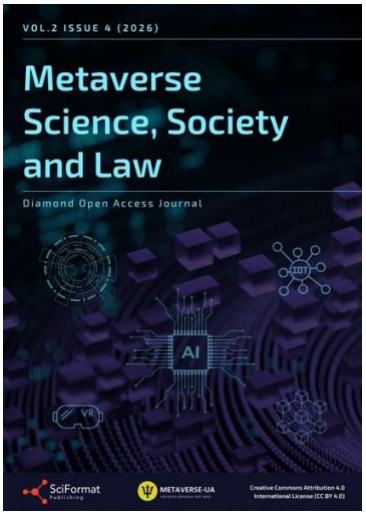


Metaverse Science, Society and Law

Vol. 2, Issue 4 (2026)

SciFormat Publishing

Publisher:
SciFormat Publishing Inc.

ISNI: 0000 0005 1449 8214
2734 17 Avenue Southwest, Calgary,
Alberta, Canada, T3E0A7

+15878858911
editorial-office@sciformat.ca

ARTICLE TITLE	OPERATIONALIZATION OF THE INTEGRAL MODEL OF HEALTH IN THE HUMAN-ENVIRONMENT ECOSYSTEM: CRITERIA, VALIDATION, AND DIGITAL BOUNDARIES
DOI	https://doi.org/10.69635/mssl.2026.2.4.69
RECEIVED	15 July 2026
ACCEPTED	17 October 2026
PUBLISHED	06 November 2026
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OPERATIONALIZATION OF THE INTEGRAL MODEL OF HEALTH IN THE HUMAN-ENVIRONMENT ECOSYSTEM: CRITERIA, VALIDATION, AND DIGITAL BOUNDARIES

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ABSTRACT

The underlying integral model defines health as a dynamic state of integral human existence in interaction with the environment. This study aims to develop a conceptually coherent architecture for operationalizing this definition and a program for its subsequent empirical validation. A conceptual integrative synthesis was conducted across biopsychosocial, salutogenic, functional, capability-based, socio-ecological, humanities-based, public policy, and digital ethics approaches. The unit of analysis is the human-environment system, with the person as the primary agent in assessment and decision-making. Six interrelated criteria were developed: integrity and coherent interaction among dimensions; adaptability; maintenance and restoration of individual balance; functional capacity and agency; viability, self-realization, and generativity; and distributed responsibility. For each criterion, constructs, candidate indicators, data sources, levels of assessment, and risks of misinterpretation were identified. An operational chain linking definition, criterion, construct, indicator, data, assessment, decision, and feedback, together with a six-stage validation program, is proposed. Within this architecture, the healthcare professional acts as a clinical expert, interpreter, partner in shared decision-making, coordinator, and guarantor of safety, without holding exclusive authority over the definition of health. Economic productivity is regarded as an important, but not exhaustive, manifestation of human capacity. The framework establishes requirements for future digital and AI solutions while preserving human judgment.

KEYWORDS

Health; Human-Environment System; Operationalization; Adaptability; Agency; Generativity

CITATION

Kostiantyn Nadutyi, Igor Naida, Yuriy Yekhanurov. (2026) Operationalization of the Integral Model of Health in the Human-Environment Ecosystem: Criteria, Validation, and Digital Boundaries. *Metaverse Science, Society and Law*. Vol. 2, Issue 4. doi: 10.69635/mssl.2026.2.4.69

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1. Introduction

The definition of health determines the boundaries of what society recognizes, measures, funds, and seeks to change. When health is equated with the absence of a diagnosis, managerial attention naturally focuses on disease and medical interventions. When the definition encompasses functioning, quality of life, adaptation, social conditions, and the environment, assessment addresses the entire system of interaction between the person and the environment. We understand the public health ecosystem as a network of people, natural and built environments, communities, professions, organizations, policies, and technologies whose interactions shape opportunities for health. This context does not replace the human-environment unit of analysis; it identifies the levels at which causes, resources, and responsibilities arise.

The Preamble to the Constitution of the World Health Organization established a normative horizon according to which "Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [1, Preamble]. This formulation broadened the medical perspective, although its emphasis on completeness and its static character complicate operational use in contexts of aging, chronic conditions, disability, crises, and rapid environmental change. The biopsychosocial model shifted the focus from isolated pathology to the interaction of biological, psychological, and social factors [2, 3]. Subsequent dynamic concepts emphasized the capacity to adapt, self-manage, and align human potential with the demands and determinants of the environment [4–6].

The first article in this series proposed the authors' integral model, in which health is described in terms of integral human existence, the interaction of five dimensions, the adaptability of the human-environment system, the ability to maintain and restore balance, and an orientation toward viability, self-realization, and generativity [7]. The next step is not the mechanical selection of existing scales, but the construction of a traceable transition from each element of the definition to measurable constructs. Without this transition, multidimensionality remains declarative, while an arbitrary set of indicators may create an appearance of precision without representing the substance of the model.

Operationalizing an integral concept requires both sufficient comprehensiveness and methodological restraint. No single indicator can represent the integrity of health. Subjective well-being cannot replace the assessment of functioning and living conditions; biomarkers do not capture meaning, dignity, or participation; and economic productivity is not a universal equivalent of viability. It is therefore appropriate to assess a profile of interrelated criteria, document context and uncertainty, and develop decisions through dialogue among the person, professionals, communities, and institutions.

The primary agent within the framework is the person, rather than their diagnosis, record, or institutional status. The role of a person receiving medical care is important, yet contextual and time-limited; family, professional, civic, creative, and spiritual dimensions of life extend beyond it. The medical perspective is therefore integrated into a broader ecosystem: the healthcare professional is responsible for clinical judgment, safety, explanation, and coordination, while the goals and acceptability of decisions are determined with the person's participation, and structural conditions are addressed with the participation of communities, organizations, and the state.

This becomes especially significant in the digital environment. Electronic records, sensors, and algorithms increase the volume and speed of observation, but data available for computation are not necessarily what matters most to the person. Algorithmic systems may reproduce inequality, conceal normative assumptions, and turn a recommendation into de facto coercion [8–10]. The operational framework must therefore assess health while also protecting agency, the right to explanation, contextual interpretation, and human decision-making.

The aim of this study is to develop systemic criteria for operationalizing the authors' integral model of health within the human-environment system and to define the sequence of their subsequent empirical validation. The study objectives are to: (1) decompose the definition without losing its semantic integrity; (2) relate its components to relevant scientific approaches; (3) develop criteria, constructs, indicator domains, and data sources; (4) establish rules of interpretation and ethical constraints; (5) outline the relationship between health and human potential, capital, and assets; and (6) propose a program for qualitative, psychometric, practical, and ethical evaluation of the framework.

2. Theoretical Foundations of Operationalization

2.1. From State to the Dynamics of Interaction

Static definitions provide a useful normative reference, but are less effective in explaining how people with chronic conditions retain autonomy, participation, meaning, and a high quality of life. A dynamic perspective shifts attention from unattainable "completeness" to processes of adaptation, recovery, and development. Huber et al. [5] proposed understanding health through the ability to adapt and self-manage; a subsequent mixed-methods study identified six domains of positive health and showed that different stakeholders assign different weights to them [6]. This provides an important methodological insight: operationalization should allow contextual weighting without undermining a shared core.

Canguilhem's philosophy of medicine helps distinguish a norm understood as a statistical average from the normative capacity of living beings to establish viable ways of relating to changed conditions [11]. For our model, this means that health is not exhausted by a return to previous parameters. It may manifest in the formation of a new, personally acceptable norm of life following injury, a chronic condition, or a change in functioning or environment. The operational implication is to compare the person not only with a population reference, but also with their own trajectory, goals, available alternatives, and the cost of adaptation.

The salutogenic approach placed the origins of health, the sense of coherence, and resources for managing stress at its center [12]. Bircher's dynamic model [4] relates individual potential to the demands of life. Its subsequent extension incorporates social and environmental determinants. The authors state: "Health is a state of wellbeing emergent from conducive interactions between individuals' potentials, life's demands, and social and environmental determinants" [13, p. 363]. Here, health emerges as a result of interaction rather than as an internal attribute of an isolated individual. This position directly supports the human-environment system as the unit of analysis.

The concepts of allostasis and allostatic load explain why adaptation is not equivalent to unlimited accommodation. McEwen shows that stress mediators can support short-term adaptive responses, yet cause damage and exhaust regulatory systems when activation is repeated or prolonged [14, 15]. The adaptability criterion must therefore account not only for the outcome achieved, but also for its biological, psychological, social, and moral costs, its reversibility, and the fairness of the distribution of burden.

The ecology of human development and a systemic understanding of living systems emphasize nested contexts and self-maintaining organization that cannot be reduced to the sum of its parts [16, 17]. Socio-ecological theory distinguishes resilience, adaptability, and transformability: a system may withstand disturbance, learn to manage change, or create a fundamentally new configuration when the previous one becomes unacceptable [18, 19]. For health, this means that a return to the previous state is not always the desired goal. Movement along a trajectory toward a new viable configuration may cautiously be described as homeorhesis: maintaining a direction of development rather than a fixed point. In this article, it is a qualitative characterization of dynamics, not a universal numerical measure.

2.2. Integrity, Functioning, and Quality of Life

The biopsychosocial tradition rejects explanations of a person's condition at only one level. Engel [2] regarded biomedical reductionism as insufficient for clinical science, while Borrell-Carrió et al. [3] clarified principles for implementing the model in practice: professional self-awareness, trusting relationships, multilevel diagnosis, and shared decision-making. The integral model extends this logic by incorporating sociocultural, environmental, and spiritual dimensions. These should not be treated as independent "compartments". Integrity manifests in coherence or tension among them: for example, stable biomedical indicators may coexist with a loss of meaning, an unsafe environment, or social isolation.

A humanities-based perspective clarifies the limits of a purely objectified account. Gadamer understands medical practice as a combination of scientific knowledge, practical judgment, and interpretation of a specific situation [20]. Merleau-Ponty's phenomenology presents the body not merely as a biological object of measurement, but as the basis of immediate human experience: perception of the world, action, and interaction with others [21]. A biometric signal therefore acquires significance only in relation to the person's experience, functioning, and context; discrepancies between instrumental data and the person's own experience require dialogical understanding rather than the automatic rejection of either source.

The International Classification of Functioning, Disability and Health provides a common language for describing body functions and structures, activities, participation, and environmental factors. The ICF considers functioning and disability in terms of the interaction between a health condition and contextual factors; personal factors are recognized as part of this context, although they are not classified within the ICF

[22]. This approach aligns well with the human-environment system, although the ICF itself does not fully encompass the spiritual dimension, generativity, or normative questions of responsibility.

Models of health-related outcomes identify causally proximal and distal levels: biological and physiological variables, symptoms, functional status, general health perceptions, and quality of life, all influenced by individual and environmental characteristics [23]. Person-reported outcomes and experiences (PROMs/PREMs) help restore the first-person perspective to assessment [24–26]. Questionnaires, however, cannot automatically become the "voice of the person": a standardized scale reflects only the questions it contains and requires supplementation through narrative and shared interpretation.

WHOQOL conceptualizes quality of life through a person's perception of their position within a cultural and value context, taking account of their goals, expectations, standards, and concerns [27]. Subsequent psychometric work confirmed the multidimensionality of this construct and the possibility of integrating general, spiritual, and personally meaningful domains [28, 29]. For operationalization, this entails combining standardized domains with contextually meaningful goals.

2.3. Capabilities, Agency, and Human Development

The capability approach shifts assessment from available goods or formal status to genuine opportunities to be and to act in ways a person has reason to value [30, 31]. The same set of resources may generate different opportunities depending on health status, discrimination, infrastructure, safety, support, and personal goals. Functional capacity within the proposed framework therefore encompasses not only the actual performance of activities, but also freedom to choose among available alternatives.

Agency denotes the ability to understand a situation, formulate goals, determine one's own priorities, participate in a decision, and revise it. It is not an immutable trait. Pain, fear, fatigue, information asymmetry, poverty, coerced employment, or an opaque algorithm may narrow the scope of genuine choice. Self-regulation also depends on how a person interprets risk and possible actions; merely providing information therefore does not guarantee the desired behavioral response [32]. Indicators of autonomy should consequently be interpreted alongside an assessment of the conditions under which choices are made. Formal consent without understandable information and realistic alternatives does not establish agency.

Buber's dialogical tradition distinguishes relating to another as an interlocutor from relating to them as an object of use or description [33]. In our framework, this is an operational rule rather than an abstract ethical declaration: the person must participate in formulating the question, identifying meaningful goals, and interpreting discrepancies. Their disagreement with an assessment is not automatically classified as a data error; it signals a need to examine context, language, the instrument's assumptions, and power asymmetry. The working configuration is not the narrow doctor–patient dyad, but a network linking the person, a healthcare or other professional, the community, and the institution, with defined roles and accountability.

Psychological well-being includes autonomy, personal growth, purpose in life, positive relationships, self-acceptance, and environmental mastery [34]. Generativity describes concern for the next generation and the creation of a contribution that extends beyond one's own lifetime [35]. The concept of human flourishing integrates happiness and life satisfaction, mental and physical health, meaning, character, and close relationships, while viewing material stability as a condition for sustaining them [36]. These approaches help distinguish generativity from narrowly defined productive output.

In this article, the spiritual dimension is not reduced to religiosity. It encompasses meaning, values, hope, inner coherence, connection with others, and experiences of transcendence consistent with the person's worldview. International consensus on the spiritual dimension of holistic care emphasizes respect for cultural diversity and the inclusion of spiritual needs only through an ethically acceptable, person-centered process [37]. Assessment of this dimension must therefore be voluntary, non-discriminatory, and open to non-religious ways of understanding life.

2.4. Social Determinants and Distributed Responsibility

Health is shaped by the conditions in which people are born, learn, work, live, and age, while the unequal distribution of power, money, and opportunities generates systematic differences in the chances of a healthy life [38–40]. Assessment that records only individual behavior may therefore shift moral responsibility for the consequences of structural conditions onto the person. Distributed responsibility acknowledges the individual's role without denying the obligations of families, employers, communities, the state, and international institutions.

The Health in All Policies approach emphasizes that transport, education, housing, work, the environment, digital policy, and economic regulation influence health no less than the medical care sector [41]. From an ecosystem perspective, this entails shared responsibility with clearly identified actors: the person participates in choosing; the healthcare professional provides clinical interpretation, safety, and coordination; the community and organization modify the conditions within their reach; and the state establishes rules, financing, and guarantees. Equitable implementation requires examining who will benefit, who will lack access, and whether inequality may increase [42]. Health system resilience entails the ability to absorb shocks, adapt, and transform while maintaining essential functions [43].

Distributed responsibility does not mean diluted responsibility. Each criterion requires an explicit mapping of which outcomes depend predominantly on individual actions; which conditions the organization must ensure; which risks require policy or environmental intervention; who has the authority and resources to act; and who is accountable for non-performance. Such a map prevents two extremes: paternalism that deprives the person of a voice, and individualization that conceals structural causes.

2.5. The Conceptual Gap Addressed by the Study

Existing approaches provide important elements of a solution, but do not constitute a ready-made operational system for the authors' definition. The biopsychosocial model supports multilevel analysis; the ICF provides a taxonomy of functioning; WHOQOL restores subjective perception; salutogenic and resilience approaches explain adaptation; the capability approach introduces freedom and justice; social determinants broaden responsibility; and research on generativity and spirituality adds temporal, meaning-related, and intergenerational perspectives. What remains lacking is a traceable connection among all components of the definition, a set of criteria, data, decisions, and the evaluation of consequences.

A second gap concerns levels of analysis. Individual scales are often used to draw conclusions about organizations or populations, while aggregate indicators are used to make judgments about individual people. These transitions give rise to ecological and atomistic fallacies. A third gap arises between measurement and action: an indicator may be reliable yet lack a clear threshold, a responsible actor, or a safe response. A fourth relates to digitalization: the technical availability of an indicator may unjustifiably increase its weight.

The proposed framework addresses these gaps through three rules. First, each indicator must be traceable to a specific element of the authors' definition. Second, the criteria form a profile and must not be collapsed into a single score before empirical and ethical validation is complete. Third, measurement is considered justified only when its interpretation can support a proportionate decision while preserving dignity, agency, and equity.

3. Methodology

3.1. Design and Unit of Analysis

The study uses a conceptual integrative synthesis design. At this stage, its purpose is neither to estimate the effect of a specific intervention nor to develop a clinical scale, but to construct a theoretically grounded architecture of constructs. The initial object of analysis was the authors' definition of health, published in the first article of the series. The chosen unit of operationalization is neither the isolated person nor a separate environment, but the human-environment system within a specific temporal, cultural, and institutional context.

The authors' definition is reproduced without changes in meaning:

Health is a dynamic state of integral human existence characterized by the coherent interaction of biological, psychological, sociocultural, environmental, and spiritual dimensions; the capacity of the human-environment system to adapt to change and maintain and restore individual balance; and an orientation toward viability, self-realization, and the generativity of life.

[7, p. 2].

Decomposition was performed using semantic predicates: "dynamic state", "integral human existence", "coherent interaction", the five dimensions, "human-environment system", "adapt", "maintain", "restore", "individual balance", "orientation", "viability", "self-realization", and "generativity". Each predicate was related to theoretical constructs, possible manifestations, levels of assessment, and risks of reductionism.

3.2. Source Selection and Synthesis

The conceptual corpus included studies and normative documents representing eight groups of approaches: (1) biopsychosocial and holistic; (2) dynamic, salutogenic, and allostatic; (3) functional, quality-of-life, and person-reported outcomes; (4) capabilities and human development; (5) socio-ecological, resilience, and intersectoral; (6) philosophical-anthropological and dialogical; (7) human potential, capital, intangible assets, and value creation; and (8) digital health and artificial intelligence ethics. Guidelines on scale development, content validity, Delphi procedures, and the clinical evaluation of digital systems formed a separate methodological component.

The synthesis is not presented as a systematic review involving an exhaustive search and quantitative pooling of findings. Sources were selected for their ability to clarify the meaning of the definition's components, propose validated domains, or identify risks of interpretation. DOIs were checked against registration records and publisher pages; normative documents against official WHO, UNESCO, OECD, and European Union resources; and bibliographic information for books against publisher and library catalogs. The temporal scope includes sources available up to October 2026.

The synthesis procedure comprised five steps. First, the semantic components of the definition were transformed into measurement questions. Second, candidate constructs and domains were identified for each question. Third, possible observable manifestations and data sources were specified. Fourth, risks of reductionism, discrimination, and erroneous causal inference were examined. Fifth, six criteria were developed and assessed for coverage of all elements of the definition without duplication of their core functions.

3.3. Methodological Principles

Operationalization is based on eight principles. The principle of correspondence requires a direct connection between an indicator, a construct, and a component of the definition. The principle of multiple methods involves combining person-reported outcomes, professional assessment, functional observations, environmental data, and administrative statistics. The principle of temporal sensitivity distinguishes state, trajectory, variability, recovery, and the accumulated cost of adaptation. The principle of contextuality precludes interpreting an indicator outside its social, cultural, and environmental conditions.

The principle of agency secures the person's participation in selecting goals and interpreting data, as well as the right to clarify, correct, or contest a conclusion. The principle of equity requires analysis of differences by sex, age, disability, income, place of residence, language, and other relevant characteristics without treating these groups as biologically determined explanations. The principle of proportionality limits data collection to what is necessary for the stated purpose. The principle of action requires every signal to have an identified recipient, a possible response, and a feedback mechanism. In the clinical module, the healthcare professional is responsible for checking safety, interpreting uncertainty clinically, and coordinating the care pathway.

Content validity is a priority because, without it, high statistical reliability merely measures the wrong construct consistently. Terwee et al. [44, p. 1159] provide the definition: "Content validity is the degree to which the content of an instrument is an adequate reflection of the construct to be measured". The construction of a numerical index must therefore be preceded by qualitative research involving representatives of different groups, assessment of relevance, comprehensiveness, and comprehensibility, and examination of invariance across contexts [45–47].

3.4. Status of the Proposed Indicators

The indicators presented below are candidates, not established thresholds or standards. Their purpose is to demonstrate how a criterion may be represented in data. Until validation is complete, it is unacceptable to create an overall rating of a person or to allocate access to services, set insurance premiums, determine fitness for work, or assign social value automatically. Any future weights must be transparent, depend on the intended use, and undergo ethical review.

4. Results: The Operational Architecture of the Integral Model

4.1. From Definition to Decision

The synthesis yields an operational chain comprising eight successive elements:
Conceptual Traceability and Practical Responsibility

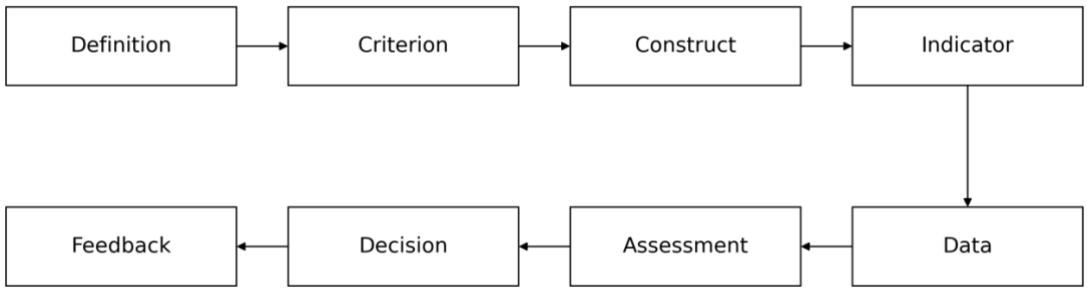


Fig. 1. *The operational chain of the integral model of health*
Source: developed by the authors.

The first four elements ensure conceptual traceability: the definition establishes meaning, the criterion provides a rule for judgment, the construct represents a theoretical property, and the indicator captures an observable manifestation. The next four ensure practical responsibility: data have known provenance and quality; assessment includes context and uncertainty; the decision is proportionate and open to appeal; and feedback evaluates the outcome. A break in any link makes application unreliable. For example, an accurate sensor reading without a valid construct does not become an indicator of health, while a valid scale without a response pathway creates an information burden without benefit.

Table 1 maps the components of the definition to the criteria.

Table 1. Mapping the components of the authors' definition to systemic criteria

Definition component	Operational meaning	Criterion	Key question
Integral human existence; coherent interaction among five dimensions	Domain levels, synergies, trade-offs, and critical discontinuities	1. Integrity and interaction	Does the configuration of dimensions support life activities that matter to the person?
The system's capacity to adapt to change	Reserve, flexibility, response to disturbance, and cost of adaptation	2. Adaptability	Can the system respond to change without an unacceptable loss of functions and agency?
Maintaining and restoring individual balance	Baseline, variability, time to recovery, and completeness of recovery	3. Balance	Is a personally acceptable range of life activities maintained or restored?
Functioning within the human-environment system	Activity, participation, available alternatives, and control over decisions	4. Capacity and agency	What can the person actually do and choose under existing conditions?
Orientation toward viability, self-realization, and generativity	Sustained opportunities, development, meaning, contribution, and an intergenerational perspective	5. Viability and generativity	Does the trajectory support development and meaningful contribution without exhausting future opportunities?
Interaction between the person and the environment	Distribution of causes, authority, resources, and accountability	6. Distributed responsibility	Who can and should change the conditions, and how is implementation verified?

4.2. Criterion 1. Integrity and Coherent Interaction among Dimensions

This criterion asks whether the biological, psychological, sociocultural, environmental, and spiritual dimensions form a viable configuration for a particular person. Its object is not a "sum of scores" across five domains, but the nature of their interaction. For conceptual purposes, the profile may be represented as a time-dependent vector $H(t) = [B, P, S, E, D]$, whose components denote the five dimensions; this notation preserves multidimensionality and is neither a validated formula nor a basis for an automatic index. Coherence means that achievement in one dimension is not sustained through the systematic erosion of another. High professional output achieved through chronic exhaustion and the loss of relationships and meaning should not be classified as a holistically favorable profile.

Candidate constructs include physical condition and symptom burden; emotional regulation and cognitive functioning; social inclusion, belonging, and cultural safety; the quality of housing, air, water, mobility, and access to nature; and meaning, values, hope, and inner coherence. Data may come from clinical sources, PROMs/PREMs, functional tests, environmental monitoring, geospatial information, narrative interviews, and self-assessment of priorities.

Assessment should include at least three types of relationship: synergies, trade-offs, and critical discontinuities. A synergy occurs when, for example, a safe public space simultaneously supports physical activity, social contact, and psychological recovery. A trade-off is a temporary loss in one domain that the person accepts in pursuit of an important goal in another. A critical discontinuity occurs when one dimension blocks the system's basic capabilities: violence, a toxic environment, severe pain, social isolation, or loss of meaning.

The risk associated with this criterion is cultural normalization. An external expert cannot define "coherence" as conformity to a standardized lifestyle. It should be assessed in relation to basic rights, safety, and the person's own goals. The spiritual dimension must not be used to impose religious practice, nor the sociocultural dimension to justify discriminatory norms. The practical outcome is a profile that records each domain's level alongside mutual reinforcement, tensions, and the person's priorities.

4.3. Criterion 2. Adaptability of the Human-Environment System

Adaptability is the system's capacity to respond to change while preserving or reorganizing vital functions, identity, and agency. It manifests before, during, and after a disturbance. Before an event, reserves, anticipation, and a diversity of strategies matter; during it, flexibility and coordination are important; afterwards, the speed, completeness, and cost of recovery or transition to a new balance become relevant. A homeorhetic perspective makes it possible to assess not only a return to the starting point, but also the preservation of a viable direction of development under changed conditions.

Candidate indicator domains include physiological reserve; cognitive and emotional flexibility; self-efficacy; access to social support; material reserves; safety at work and at home; access to care; digital and transport connectivity; and the organization's capacity to change its processes. Clinical assessment may examine recovery after exertion, symptom stability, and participation in rehabilitation. Community assessment may examine continuity of essential services, access to support for vulnerable groups, and the ability to learn after a crisis.

It is important to distinguish adaptation from forced endurance. A person may retain a formal capacity to work in unsafe conditions at the expense of sleep, health, and future functioning. This represents short-term compensation, not healthy adaptability. The outcome must therefore be assessed alongside its allostatic, temporal, financial, and moral costs, and whether the system could modify the environment itself. A socio-ecological perspective recognizes environmental transformation as a legitimate strategy rather than placing the entire burden of adaptation on the individual [18, 19].

To characterize a trajectory, it is useful to distinguish at least four states: stable favorable adaptation; strained compensation; unstable recovery; and transformational adaptation. These are neither diagnoses nor a hierarchy of human worth. They are working descriptions of a process that should lead to different responses: supporting reserves, reducing burdens, restoring access, or changing institutional conditions.

4.4. Criterion 3. Maintenance and Restoration of Individual Balance

Balance in the integral model is dynamic, personally meaningful, and contextual. It is neither unchanging indicators nor a return to an abstract norm. It should be understood as a range within which a person can sustain vital functions, coherence of experience, an acceptable level of participation, and the ability to direct their own life. This range changes across different periods of life.

Operationally, it is useful to assess the baseline, variability, frequency of excursions beyond individually acceptable limits, time to recovery, completeness of recovery, and the cost of stabilization. Such assessment requires repeated observations. A single cross-sectional measurement cannot distinguish a temporary fluctuation, a seasonal pattern, and a sustained adverse trajectory. Personal digital data may improve temporal resolution, but must not displace subjective assessment or generate continuous surveillance.

In a clinical context, relevant domains may include symptoms, sleep, pain, emotional state, everyday activity, and the ability to resume familiar or revised roles. In a social context, they may include income predictability, safety, caregiving burden, relationship stability, and access to services. In a spiritual context, they include a sense of meaning, hope, and inner coherence. Balance must be defined with the person: one person may prioritize symptom reduction, another the opportunity to study, care for loved ones, or return to creative activity.

The Safety-II approach proposes studying not only adverse events, but also how a system successfully adapts to variability in everyday practice [48]. For the proposed criterion, this means documenting factors that already sustain balance: personal practices, mutual support networks, available services, and workplace accommodations. Decisions should therefore address deviations while also protecting effective supports.

4.5. Criterion 4. Functional Capacity and Agency

Functional capacity encompasses the opportunity to act, fulfil meaningful roles, participate in life, and make genuine choices. It develops through the interaction of bodily functions with technologies, support, accessibility, rules, and the attitudes of others. The same functional impairment may therefore have different consequences in barrier-free and inaccessible environments.

Candidate domains include mobility, self-care, communication, learning, work, caregiving, civic participation, digital participation, and opportunities for rest. Agency is assessed through understandable information, participation in goal-setting, the availability of alternatives, control over data, and the ability to refuse and appeal. Actual activity must be distinguished from capability: a person may choose not to exercise a particular opportunity, which does not constitute a health deficit.

In clinical application, the healthcare professional's role must be visible yet clearly delimited. The professional combines information about functions and risks with the person's own experience, explains uncertainty, distinguishes safe from unsafe alternatives, supports shared decision-making, and coordinates interaction with rehabilitation, psychological, and social services. Professional judgment does not override the person's goals, while the person's choice does not make them responsible for an inaccessible environment or institutional constraints.

Economic productivity is a meaningful manifestation of functional capacity, since work can provide income, the development of mastery, a sense of belonging, autonomy, and a contribution to a shared outcome. In international business, human capital is associated with knowledge, skills, health, innovativeness, and adaptability, while the concept of the human asset extends this framework to encompass social and ethical value, uniqueness, culture, and long-term organizational resilience [49, 50]. Naida [50] also describes trust, meaning, co-creation, and employee experience as conditions for the transition from individual potential to collective and organizational value.

Functional capacity and a person's contribution to community life manifest in different spheres and at different stages of life. Caregiving, learning, volunteering, civic participation, and creativity may have generative value beyond paid employment, including in childhood and old age. Human dignity and the right to health retain their unconditional value regardless of current productivity. Economic outcomes should therefore be included in assessment as one contextual domain. The proposed framework allows the concept of productivity to be extended subsequently to its social, creative, civic, reproductive, and generative dimensions. This article focuses primarily on the economic dimension.

The organizational interpretation of this criterion must be reciprocal. Assessment concerns not only what the person can contribute to the organization, but also whether the organization provides safe conditions, autonomy, fair remuneration, learning, trust, and opportunities for recovery. Transforming potential into capital and assets is a shared process; it cannot ethically be described as the unilateral "use" of a person. Practical signals may include sustained participation, development opportunities, quality of interaction, innovative behavior, staff turnover, absence of exhaustion, and perceived fairness.

4.6. Criterion 5. Viability, Self-Realization, and Generativity

The fifth criterion introduces temporal and teleological perspectives: what matters is not only current functioning, but also the capacity to sustain life, develop capabilities, pursue meaningful intentions, and make contributions that support others and the future. Viability encompasses basic safety, reserves, and the duration of active participation. Self-realization concerns developing and applying abilities in accordance with one's own values. Generativity connects the individual trajectory with caregiving, knowledge transmission, upbringing, creativity, institution-building, and responsibility toward future generations.

Operational domains may include a sense of purpose in life; the ability to set and revise goals; learning and development; creative and professional fulfilment; caring for loved ones; mentoring; volunteering; community participation; the creation of knowledge, cultural goods, or material goods; and environmental responsibility. Their configuration differs across life stages. A young person's generativity may manifest in learning and civic action, an employee's in co-creation and the transfer of competence, and an older person's in mentoring, memory, and support for intergenerational relationships.

This criterion protects the model from equating health with short-term efficiency. Activities that increase output today may reduce future viability through exhaustion, lost learning opportunities, environmental damage, or the erosion of social trust. Generative productivity, by contrast, assesses the capacity to create conditions in which life, knowledge, relationships, and institutions can continue and develop. Economic value forms part of this picture when its creation does not undermine human dignity or future capabilities.

Publications on human capital and intangible assets reveal important mechanisms through which individual potential becomes long-term organizational value via innovativeness, adaptability, trust, meaning, and co-creation [49, 50]. These propositions form a substantial part of the article's interdisciplinary foundation and deepen understanding of the relationship between health, functional capacity, and the realization of human potential. Together with the authors' proposed definition of health and the broader interdisciplinary synthesis, they contribute to the development of the integral model of health.

The risk in operationalization lies in imposing an external purpose. Self-realization cannot be assessed by the prestige of an occupation, income level, or conformity to a cultural template. Nor should generativity become an obligation to be constantly useful. The right to rest, dependence on support, periods of recovery, and the choice of a private life remain compatible with health. Measurement should examine the availability of opportunities and their personal significance rather than establish a moral ranking.

4.7. Criterion 6. Distributed Responsibility

The sixth criterion describes how far the system distributes obligations, authority, and resources in accordance with actual causes and capacities to influence them. It is cross-cutting and transforms the assessment profile into a map for action. At the individual level, informed understanding, choice, and self-management skills are relevant; the healthcare or other professional is responsible for professional assessment, safety, explanation, and coordination; the immediate social circle for support and freedom from violence; the organization for working conditions, accessibility, and fair procedures; and the community and state for infrastructure, social protection, the environment, access to care, and accountability.

Operational questions include: who controls the determinant; who has a mandate to act; whether resources are available; whether the person participates; whether a time limit and an appeals channel exist; and how implementation is monitored. The result may be a RACI matrix adapted to health: those responsible for implementation, the accountable decision owner, those consulted, and those informed. For intersectoral decisions, effects on equity and future generations are added.

This criterion protects against "behavioral reductionism". If a person lives in an area with polluted air, poor transport accessibility, and unsafe work, a recommendation to exercise more or "manage stress" better does not match the distribution of causes. Individual support may be useful, but it must be accompanied by organizational and policy action. Similarly, an employer should not use well-being programs as a substitute for safe workloads, autonomy, and fair pay.

Distributed responsibility also limits excessive paternalism. The state, an organization, or a digital platform does not acquire the right to optimize a person's life without their participation merely because it holds their data. Decisions must be least restrictive, explainable, and open to appeal. Where decision-making capacity is temporarily reduced, supported decision-making, previously expressed preferences, and regular review of representation are needed.

4.8. Consolidated Operational Matrix

Table 2 summarizes the proposed constructs, candidate manifestations, data sources, and cautions. It is a map for instrument development, not a ready-to-use instrument. Each practical context requires the selection of a minimally sufficient set of indicators and its evaluation together with the target group.

Table 2. Consolidated matrix for operationalizing the criteria

Criterion	Key constructs	Candidate indicators	Data sources	Risk of misinterpretation
1. Integrity and interaction	Biological, psychological, sociocultural, environmental, and spiritual domains; synergy and conflict	Symptom burden; emotional state; belonging; environmental safety; meaning; personal priorities	PROMs/PREMs; clinical data; interviews; environmental monitoring; geospatial data	Summing incommensurable domains; culturally imposing a "correct" way of life
2. Adaptability	Reserve; flexibility; response; transformation; cost of adaptation	Recovery after exertion; access to support; continuity of functions; changes in conditions	Repeated measurements; functional tests; clinical interpretation; organizational and community data	Mistaking forced endurance for healthy adaptation; shifting the burden onto the person
3. Balance	Baseline; variability; time, completeness, and cost of recovery	Sleep; pain; mood; activity; stability of roles; predictability of conditions	Diaries; sensors with consent; PROMs; clinical and social data	A universal "norm" instead of the individual trajectory; excessive monitoring
4. Capacity and agency	Functions; activity; participation; freedom of choice; control over data	Mobility; learning; work; caregiving; civic and digital participation; availability of alternatives	ICF; functional tests; self-assessment; accessibility audit; shared decision-making records	Equating actual activity with capability; equating human worth with productivity
5. Viability and generativity	Safety; reserves; purpose; development; creativity; caregiving; contribution to the future	Sustained participation; learning; mentoring; creative or civic contribution; sustainability without exhaustion	Narrative; well-being scales; activity portfolios; participation data with consent	Imposing external goals; a moral obligation to be constantly useful
6. Distributed responsibility	Control over the determinant; mandate; resources; accountability; appeal	Identified responsible actor; deadline; resource; personal participation; implementation; effects on inequality	Policies; budgets; audit; intersectoral responsibility matrix; requests and complaints	Diluted responsibility or paternalism; formal participation without genuine influence

The matrix deliberately combines three perspectives. The first is the first-person perspective: how the person assesses their condition, opportunities, meaning, and priorities. The second is professional or functional: which characteristics are observed using validated methods. The third is structural: which conditions shape available opportunities. Discrepancies among them are not "noise", but a subject of analysis. For example, a high self-assessment in unsafe conditions may reflect adapted expectations, while a low self-assessment in formally favorable conditions may indicate an unrecognized experience or barrier.

The unit of decision must be specified in advance for each application. At the clinical level, this may be a shared care plan; at the organizational level, a change in working conditions; at the community level, investment in accessibility; and at the population level, resource reallocation. Data sufficient for one decision may be unacceptable for another. An individual profile should not be passed to an employer for personnel selection, nor a district-level index used to deny a particular person a service.

5. Program for Empirical Validation

5.1. Stages of Evaluation

The transition from conceptual framework to instrument should proceed in stages. Six interrelated stages are recommended, as presented in Table 3.

Table 3. Program for empirical validation

Stage	Purpose	Main methods	Outcome and progression criterion
1. Qualitative co-design	Assess language, comprehensiveness, and personal significance	Interviews; focus groups; cognitive testing; maximum-variation sampling	A domain map and understandable vocabulary; no substantial unaddressed themes
2. Content validity and Delphi	Assess relevance, comprehensiveness, comprehensibility, and interdisciplinary agreement	CVI/COSMIN; 2–4 Delphi rounds; pre-specified consensus	An agreed core of criteria and documented disagreements
3. Indicator bank	Map criteria to minimally sufficient measures	Review of validated scales; mapping; specification of purpose, burden, and prohibited uses	Specification of the core and modules; traceability of every indicator
4. Feasibility pilot	Assess acceptability, accessibility, and the system's readiness to respond	Field pilot; missing-data analysis; completion time; interviews; alternative channels	Acceptable burden, accessibility, and a defined response pathway
5. Psychometric evaluation	Assess structure, reliability, error, validity, and responsiveness	Factor analysis; test–retest; DIF/invariance; hypothesis testing; responsiveness	Evidence of measurement properties for a specific purpose and population
6. Usefulness, equity, and consequences	Assess effects on decisions, outcomes, inequality, and agency	Pragmatic evaluation; subgroup analysis; audit; monitoring of unintended consequences	Benefits outweigh risks; decisions can be appealed; ongoing oversight is in place

At the first stage, qualitative interviews, focus groups, and cognitive testing should examine whether different groups understand the criteria, what meanings they assign to balance, viability, and generativity, and which domains are missing. The sample should deliberately include different age groups, health conditions, settlement types, cultural and linguistic contexts, and experiences of disability, migration, military service, caregiving, and insecure employment. This stage produces not only a list of items, but also a vocabulary of acceptable, non-discriminatory language.

The second stage involves content validity assessment and expert consensus. The panel should include not only clinicians and researchers, but also professionals in public health, rehabilitation, psychology, social work, environmental science, ethics, economics, law, and digital technologies, as well as community representatives. The Delphi procedure requires anonymity across rounds, pre-specified consensus rules, feedback, and a transparent account of item exclusion [51, 52].

The third stage establishes a bank of candidate indicators. Each indicator is documented in terms of its definition, scale, time horizon, source, respondent burden, expected action, and undesirable use. The bank may include existing validated instruments, new items, functional tests, and environmental measures. Reuse of validated scales should be preferred where their content and cultural adaptation match the construct. A new instrument is justified only where existing instruments do not cover the required content.

The fourth stage pilots feasibility and acceptability. Assessment covers completion time, the proportion of missing responses, comprehensibility, digital accessibility, willingness to disclose sensitive data, professional workload, and the system's capacity to respond. Alternative channels should be tested: digital, paper-based, oral, and assisted. A low response rate in a particular group should not be interpreted as an absence of need; it may signal a barrier.

The fifth stage involves psychometric and structural evaluation. Depending on the construct type, this includes reliability, measurement error, structural and cross-cultural validity, hypothesis testing, responsiveness, and invariance. Formative constructs, in which indicators jointly constitute a phenomenon, should not be assessed using the same assumptions as reflective scales. Excessive internal consistency may indicate item duplication rather than comprehensive content coverage [45, 46].

The sixth stage assesses usefulness for decisions, equity, and consequences. It is necessary to determine whether the framework changes decisions, improves alignment with the person's goals, increases inequality, or generates stigma and excessive surveillance. False-positive and false-negative signals, the distribution of benefits and risks, the possibility of appeal, costs, and organizational readiness are assessed. Only then can thresholds, weights, or composite indices be discussed.

5.2. Time, Levels, and a Minimally Sufficient Set

A comprehensive framework does not mean that every indicator should always be collected. A core-and-module structure is appropriate. The core contains brief signals across the six criteria, personal priorities, and key environmental factors. Modules are expanded according to purpose: clinical, rehabilitation, occupational, community, crisis, environmental, or digital. This structure reduces burden while maintaining conceptual unity.

The temporal model should include at least a baseline state, an event or change, a short-term response, and a longer-term trajectory. Collection frequency depends on the rate at which the construct changes. Heart rate and sleep may vary daily; social participation weekly or monthly; and purpose in life more slowly, although a crisis may change it abruptly. Excessive frequency reduces acceptability and may turn self-monitoring into a source of anxiety.

At the individual level, results should be presented as a profile and trajectory rather than a rank. At the group level, they should show distributions, heterogeneity, and the proportion of people with unmet needs. At the population level, they should be presented alongside social and environmental determinants. Aggregation must preserve the visibility of minorities: an average improvement may conceal deterioration for a small group.

5.3. Rules of Interpretation

Five rules are proposed. First, a deviation in an indicator is a signal for clarification, not an automatic conclusion. Second, a causal explanation cannot be inferred from correlation without additional evidence. Third, the significance of change is assessed statistically, clinically, and personally. Fourth, discrepancies between data sources are discussed rather than resolved by automatically prioritizing an "objective" source. Fifth, the decision is reviewed using feedback on the actual outcome.

The practical expression of agency is not an absolute right to reject any fact, but a set of procedural safeguards: obtaining an understandable explanation, adding context, correcting data, refusing optional monitoring, requesting human review, and appealing a decision. Such an "agency-based veto" suspends the automatic application of a contested interpretation pending review, but does not remove the healthcare professional's duty to warn of clinically significant risk and act within their professional and legal responsibilities.

These rules are particularly important for economic data. Increased participation in work may be favorable if it aligns with the person's goals, is supported by safe conditions, and does not displace recovery. The same change may be adverse if driven by financial coercion and accompanied by exhaustion. Productivity therefore requires interpretation alongside autonomy, resilience, environmental quality, and the long-term trajectory.

6. Discussion

6.1. Scientific Contribution of the Framework

The proposed architecture develops the underlying integral model in three directions. The first is conceptual traceability: each criterion is derived from a semantic component of the definition and related to scientific approaches. The second is operational completeness: each construct is linked to an indicator, a data source, an assessment method, a decision, and feedback. The third is normative protection: agency, equity, proportionality, and distributed responsibility are not external ethical additions, but part of health assessment itself.

The framework's ecosystem contribution lies in preserving the person as the primary agent without isolating them from the network of conditions and responsible actors. The clinical module, community policy, working conditions, and digital infrastructure use shared criteria while having different units of decision. This makes it possible to combine the healthcare professional's role with intersectoral responsibility without medicalizing the whole of human life.

Unlike models that focus predominantly on the state of the body or the individual's capacity to adapt, the framework makes change on both sides of the system visible. The person can develop skills and reserves; the environment can be accommodated, improved, or transformed. This is particularly important in disability, occupational health, environmental risks, and social inequality, where a demand to "adapt better" may conceal available structural solutions.

The framework also distinguishes viability from survival, balance from immobility, functioning from compliant role performance, and generativity from short-term productivity. These distinctions prevent the paradox in which a system considers healthy a person who delivers high current output at the cost of future exhaustion, or unhealthy a person with a chronic condition who has autonomy, participation, meaning, and a sustained quality of life.

6.2. Health, Human Potential, and Economic Productivity

In the proposed model, health is both a value in itself and a condition for realizing human potential. Potential encompasses opportunities that have not necessarily been realized. Human capital describes developed knowledge, skills, health, and other qualities capable of creating value through activity. The human asset concept emphasizes the strategic, social, and ethical significance of people for an organization's long-term capability. These categories overlap, but are not synonyms for the person.

The studies by Pryiatelchuk and Naida [49] and Naida [50] support several components of this transition: the roles of health, adaptability, innovativeness, trust, culture, meaning, engagement, and co-creation in generating long-term organizational value. They are used as additional support for particular components, rather than as the source of the integral definition of health. An important conclusion for this article is that an economic outcome arises through the relationship between a person's abilities and the organizational environment, and therefore cannot be attributed solely to an individual characteristic.

A central economic pathway for future application may be the sequence "health — capability — participation — productivity — sustainable value". It should not be understood as a one-way causal chain. Decent work, fair income, learning, and trust can support health; unsafe conditions, insecurity, and excessive control undermine it. Organizational assessment must therefore investigate reciprocal influences, time lags, and the distribution of benefits.

The productivity framework remains open to further development. This article prioritizes economic productivity as the most directly measurable and institutionally significant pathway. Subsequent studies may systematically develop social productivity as the creation of trust and relationships; creative productivity as the emergence of new meanings and solutions; civic productivity as participation in shared governance; reproductive and care-related productivity as the sustaining of life; and generative productivity as a contribution to future generations. This extension does not reject the economic dimension, but places it within a fuller system of human value.

6.3. Digital Measurement and the Boundaries of Algorithmic Use

Digital technologies can support the proposed framework through repeated measurements, integration of different sources, personalized feedback, and early detection of adverse trajectories. Artificial intelligence can identify complex patterns in images, texts, and time series, help predict risks, and coordinate care [53, 54]. At the same time, there is a risk of algorithmic depersonalization: reducing a person within analytical models to a code, cost measure, risk score, or predicted behavior, thereby overlooking the integrity of their existence, dignity, and capacity for self-determination. This is not a universally established mechanism, but a normatively significant risk that must be examined in design, data, and consequences. Technical performance alone does not guarantee clinical usefulness, equity, or alignment with the person's goals [55].

A well-known example of algorithmic bias showed that using costs as a proxy for need led to systematic underestimation of the health needs of Black patients. The authors found: "At a given risk score, Black patients are considerably sicker than White patients, as evidenced by signs of uncontrolled illnesses" [8, p. 447]. This case illustrates a central requirement of our architecture: an indicator must validly represent a construct rather than merely be an available variable.

Ethical guidelines converge on human control, transparency, fairness, safety, privacy, and accountability [56–60]. WHO emphasizes the need to retain human control over healthcare systems and medical decisions as part of protecting human autonomy when artificial intelligence is used [58]. The EU Artificial Intelligence Act also requires high-risk systems to "be effectively overseen by natural persons during the period in which they are in use" [61, Article 14(1)].

Within the integral model of health, human control must provide genuine influence over data use and decision-making. The person must understand the purpose of data collection, have access to information that matters to them, be able to correct errors, choose an acceptable level of personalization, refuse optional monitoring, and appeal decisions. The healthcare professional or other authorized professional must understand the capabilities and limitations of the algorithmic model, know the provenance of the data, consider alternatives, and assess whether its conclusions are justified within the relevant professional context, while retaining responsibility for their own decisions. The institution must ensure audit, cybersecurity, and a clear pathway to assistance when the system signals a risk.

O. Kostenko emphasizes the need for interdisciplinary assessment of the psychological, emotional, and sociocultural consequences of artificial intelligence, particularly for vulnerable groups, and for combining preventive, adaptive, and corrective regulatory mechanisms [71]. Within the integral model of health, we develop this position into a requirement to examine whether a digital solution supports the person's autonomy, trust, social participation, and self-realization. Validation must accordingly include prior risk assessment, monitoring of consequences, and procedures for correcting or discontinuing use of the system.

Explainability is necessary, but not sufficient. A technical explanation may be plausible yet fail to reflect the model's actual logic or causality [62]. A useful explanation must match the recipient's role: for the person, it should show what influenced the recommendation and how to contest it; for the professional, the limits of applicability and uncertainty; and for the auditor, the data, version, subgroup performance, and history of changes [63].

Digital systems should be developed and evaluated in stages. DECIDE-AI sets requirements for early clinical evaluation of decision support systems, while CONSORT-AI and SPIRIT-AI address reporting of trials and protocols [64–66]. The roadmap for responsible machine learning additionally emphasizes multidisciplinary involvement, external validation, and post-deployment monitoring [10]. Distributed ledgers may support the integrity of access logs, but do not in themselves resolve issues of data quality, the right to correction, or governance [67].

Within this series of articles, the proposed criteria serve as a bridge to the next level of research: they may become an architecture of requirements for evaluating digital and AI solutions. A future model must assess not only algorithmic accuracy, but also its effects on the six criteria, agency, and the distribution of responsibility. This transition requires separate theoretical and empirical justification; this article does not attribute to technologies an automatic capacity to preserve the integrity of health.

6.4. Practical Application Scenarios

In primary care, a brief core of criteria may structure a discussion of functioning, the environment, and goals alongside clinical assessment. The healthcare professional performs five interrelated functions: clinical expert, interpreter of data and experience, partner in shared decision-making, pathway coordinator, and guarantor of safety. The result should be a shared plan that includes, alongside treatment, rehabilitation, psychological or social support, changes in conditions, or referral to community resources. Value in healthcare can appropriately be related to outcomes that matter to the person relative to the costs of the full cycle of care [68], while the outcome set must extend beyond clinical indicators.

In rehabilitation, the framework helps relate functions, activities, participation, and the environment to personal goals. In public health, it enables population data to be combined with inequalities in access and environmental conditions. In crisis management, adaptability and recovery criteria direct attention to continuity of functions, reserves, and support for groups at higher risk. In employment policy, functional capacity, agency, and distributed responsibility help assess not only entry into work, but also its quality, safety, sustainability, and effects on health.

Sweden's National Quality Registries offer a useful, but limited, external reference: they connect individualized data on conditions, interventions, and outcomes with continuous improvement of care [69]. The comparison should be functional rather than ranking-based. Registry infrastructure demonstrates the possibility of systematic feedback, while the proposed framework additionally addresses the five dimensions, the environment, agency, and distributed responsibility. This represents a potential expansion of the scope of assessment, not a claim of superiority over the Swedish model.

The Ukrainian context makes adaptability, recovery, and continuity of functions particularly significant. The European Observatory on Health Systems and Policies describes the continuation of Ukraine's financing and organizational reforms amid full-scale war and heavy pressure on the system [70]. For operationalization, this entails simultaneously monitoring the personal trajectory, access to care, displacement, environmental safety, workforce and infrastructure constraints, and communities' capacity to maintain essential functions. The framework's relevance to crises does not replace its empirical validation.

For organizations, the framework proposes shifting attention from "optimizing the employee" to the quality of interaction between the person and the work environment. Practical questions concern accessibility, control over workload, learning opportunities, psychological safety, fairness, recovery, meaning, and participation in change. Health data must be kept separate from punitive personnel decisions, collected for a clearly defined purpose, and not used for covert discrimination.

6.5. Limitations

The study is conceptual and does not establish the validity of a specific scale, the weights of criteria, or the causal effects of the proposed decisions. The integrative selection of literature was not a systematic review; particular disciplines and non-English-language traditions may therefore be incompletely represented. The use of Canguilhem, Gadamer, Buber, and Merleau-Ponty is interpretative and will require further interdisciplinary examination. The authors' definition is broad, increasing the risk of an excessively extensive instrument; the proposed modular structure requires practical evaluation.

Spirituality, generativity, balance, and agency are culturally sensitive and may have different linguistic equivalents. They cannot be transferred between groups without cognitive testing and invariance analysis. Some structural determinants are observed at the community or policy level and must not be attributed to the individual. The converse challenge is that aggregate data may conceal personal priorities.

The economic pathway of productivity is outlined conceptually in this article. Its subsequent measurement will require distinguishing presence, actual output, quality, innovativeness, learning, long-term capability, and the cost of exhaustion. Other forms of productivity are identified only as directions for development. This boundary is deliberate: the article develops criteria for health rather than a complete theory of all forms of human contribution.

The digital section sets requirements for future application without demonstrating the advantages of any particular technology. Algorithmic performance varies across contexts, and regulatory regimes evolve. The Swedish and Ukrainian examples are illustrative rather than comparative evaluations. Any implementation will require an up-to-date legal review, local validation, participation by people and healthcare professionals, and continuous monitoring.

7. Conclusions

The authors' definition of health can be operationalized without losing its holistic and humanistic meaning if the unit of analysis remains the human-environment system, the person remains the primary agent, and measurement is connected to decisions and feedback. Six systemic criteria are proposed: integrity and coherent interaction among dimensions; adaptability; maintenance and restoration of balance; functional capacity and agency; viability, self-realization, and generativity; and distributed responsibility. An ecosystem perspective establishes distinct yet interrelated roles for the person, healthcare professional, other professionals, community, organization, and state.

The criteria are not interchangeable and should not be prematurely collapsed into a single numerical index. They should be presented as a profile, trajectory, and map of interactions, combining the person's perspective, functional data, and environmental characteristics. A deviation in an indicator provides grounds for dialogue and clarification, rather than an automatic decision.

Health supports the transition from human potential to participation and value creation. Economic productivity is an important, but not exhaustive, manifestation of this transition. Its assessment must include reciprocal influences between the person and the organization, long-term viability, and the inadmissibility of reducing dignity to output. Further expansion of the productivity framework may encompass social, creative, civic, care-related, and generative contributions.

Before practical use, a six-stage validation program is required: qualitative co-design, content validity assessment and Delphi consensus, establishment of an indicator bank, feasibility piloting, psychometric evaluation, and assessment of usefulness, equity, and consequences. Thresholds, weights, or automated rules may be established only after these stages.

The resulting operational architecture creates a methodological bridge between the integral model of health and the subsequent study of digital and AI-mediated systems. In such systems, the criteria should define what is assessed and establish boundaries beyond which technological optimization threatens agency, equity, and the integrity of human existence. Specific mathematical, neuromorphic, graph-based, topological, blockchain, and tokenomic solutions remain the subject of the third article and require separate technical, legal, and empirical justification.

Declarations

Ethics approval. Not applicable: the study is conceptual and involved no participants, personal data, or biological materials.

Data availability. No new empirical datasets were generated. Conceptual materials and sources are described in the text and reference list.

Conflicts of interest, funding, and author contributions must be finalized by all authors before manuscript submission.

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Dedicated to the memory of Taras Bebeshko and Valentyn Pidvysotskyi, co-authors of the underlying integral model of health.