

Olya Harizanova

INTEGRATED

ARTIFICIAL INTELLIGENCE

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INTRODUCTION

This book is the product of a longstanding professional interest in the relationships between human beings, knowledge and intelligent technologies, together with research conducted during a period of rapid advances in artificial intelligence (AI). Interaction with these systems is changing not only how we produce texts, analyse information and make decisions, but also how we think, formulate questions, seek meaning and construct new knowledge. The book is devoted to these changes and to the conditions under which they arise.

The subject of the present study is the interaction between human beings and AI systems. This interaction is viewed as a new space in which qualitatively different cognitive, emotional and creative processes can unfold. The focus is not on the technologies and algorithms themselves, but on the dynamics and outcomes of this interaction.

The principal aim of the book is to propose a conceptual framework for explaining changes in intellectual activity. These changes occur when human capabilities and the functional capacities of AI systems are combined through sustained, purposeful and reflective interaction.

In recent years, numerous studies have examined the capabilities, limitations and applications of AI. Considerably less attention has been devoted to human–AI interaction. The new phenomena that emerge from this interaction also remain insufficiently explored. This research gap provided the impetus for the present study. The analysis demonstrated the need for a more fully developed conceptual framework through which the observed phenomena could be understood. This led to the formulation of the author-developed concepts presented in the book: the space for cognitive dialogue, the cognitive resonator, cognitive resonance, emotional resonance, creative resonance, emergent knowledge and integrated intelligence. These concepts have not been introduced merely to establish a new terminology. Rather, they provide the means to understand phenomena that are becoming increasingly evident in contemporary intellectual practice. Their development involved an extended process of analysis, comparison, critical reflection and repeated refinement.

It gradually became clear that defining individual concepts was not sufficient. Over the course of the research, a coherent terminological system was

developed in which each principal concept occupies a specific place within a unified conceptual architecture. Once introduced, the concepts retain a consistent meaning throughout the book. The relationships between them are based on cumulative conceptual development rather than partial overlap or synonymous usage. The book therefore offers not only a model of human–AI interaction, but also a scholarly language for its investigation and analysis.

Although the term “integrated intelligence” appears in academic and professional literature, it does not yet have a generally accepted definition or a unified theoretical foundation. In this book, integrated intelligence is conceptualised as an emergent form of intellectual organisation. It manifests itself within a system of interaction involving a human being, AI and the relevant sociotechnical environment when their different functions are coordinated and transformed into a shared cognitive process. This understanding does not imply a merging of the human being and AI or the emergence of an autonomous collective subject.

A generative AI system (ChatGPT)^{1,2} was used as an auxiliary research tool in refining the conceptual framework. The system was employed to generate alternative formulations, structure individual arguments and improve the linguistic presentation of the text. All generated suggestions were subjected to critical evaluation, verification and revision by the author. The research questions, theoretical decisions, interpretations, conceptual architecture and final text are the outcomes of the author’s own research. The AI system used is neither an author nor a co-author, and no independent intellectual contribution is attributed to it. It cannot assume academic, ethical or legal responsibility. Full responsibility for the accuracy, originality, integrity and content of the book rests with the author.

¹ ChatGPT is an AI assistant developed by OpenAI. It can answer questions, explain complex topics, write, edit and translate texts, and assist with learning, idea generation, planning and programming. It can also analyse documents, images and data. ChatGPT may use different OpenAI large language models (LLMs), depending on the selected mode and task. Of particular importance to the present study, however, is the fact that current LLMs do not think or understand in the same way as human beings. They may also produce responses that sound convincing but are nevertheless incorrect. Consequently, outputs generated by ChatGPT may be inaccurate, incomplete or biased.

² Why ChatGPT in particular? It is currently the most widely used consumer AI assistant. Comparable estimates by *Sensor Tower* put the numbers of monthly active users in mid-2026 at approximately 1 billion for ChatGPT, 472 million for Google Gemini, 106 million for Doubao, 78 million for Dola and 68 million for DeepSeek (*El País*). These figures indicate that ChatGPT holds a dominant position. It should also be emphasised that they do not represent registered accounts, as companies do not generally disclose such information. They refer to monthly active users of the respective applications, measured using a consistent methodology. Other sources report different figures. QuestMobile, for example, reports 127 million DeepSeek users in China alone, but applies a different scope and methodology.

During the preliminary stage of the research, the author used several other AI systems, including DeepSeek, Kimi, Gemini and Use. ChatGPT was ultimately selected because it proved the most suitable for the specific tasks, working methods and criteria adopted by the author.

Working with the system served a dual purpose. On the one hand, it constituted a practical use of AI. On the other, it generated data for analysis. These data were used to trace the reciprocal influence between the human participant and the generative AI in the course of dialogue.

Within the proposed conceptual framework, cognitive resonance denotes changes in human understanding and in the organisation of concepts. Creative resonance expands the range of possible solutions. Emotional resonance sustains human engagement and communicative attunement. For the human participant, these dynamics may be experienced as understanding, trust, motivation or inspiration. In the AI system, however, they are realised only at a functional level. The system processes the inputs it receives and adapts its subsequent responses. This does not imply consciousness, subjective experience or intention of its own.

Observations of this process support the author's theoretical proposition that, under certain conditions, interaction between a human being and generative AI may be analysed as an asymmetrical co-creative interaction. This concept describes the system's functional participation in generating alternatives and iteratively refining the resulting product. It does not imply authorship, co-authorship, equal intellectual participation or autonomous creative initiative. The use of AI may expand the range of possible solutions and support particular stages of the work. The objectives, evaluation criteria, selection, verification, interpretation and final decisions, however, remain the responsibility of the author. Human beings and AI are not equal in terms of consciousness, intention, authorship or responsibility. Whether a particular interaction exhibits characteristics of integrated intelligence must be established through clear criteria, operationalisation and empirical verification, without attributing to the system the status of an autonomous epistemic agent.

The book does not claim to offer a definitive or complete theory. It advances a theoretical proposition whose concepts, relationships and explanatory potential remain open to criticism, testing and further development. The definitions, axioms, principles and models presented here are intended to provide a foundation for scholarly dialogue and subsequent interdisciplinary research into human–AI interaction. In the author's view, the most valuable ideas rarely emerge as fully formed solutions. They develop gradually through sustained dialogue, in which questions, arguments, doubts and different perspectives complement and transform one another. The author's position is that the development of AI requires not only technological analysis, but also philosophical reflection, methodological systematisation and ethical governance.

The book presents the results of an investigation into the conditions under which the functional capacities of AI can be incorporated into human-directed, value-oriented and creatively productive intellectual activity. Research of this

kind is particularly important today. We are entering a period that requires not only more advanced technologies, but also a new scholarly language. Such a language is needed to identify and explain the changes in human cognition, creativity and collaborative thinking brought about by these technologies. If the proposed conceptual framework stimulates new questions, research and interpretations, the book will have fulfilled its purpose.

During the preliminary stage of the research, the author used several other AI systems, including DeepSeek, Kimi, Gemini and Use. ChatGPT was ultimately selected because it proved the most suitable for the specific tasks, working methods and criteria adopted by the author.

METHODOLOGY FOR IDENTIFYING INTEGRATED INTELLIGENCE

Existing research on human–AI interaction describes a wide range of forms of assistance, cooperation, and co-creation, but often does not provide sufficiently clear grounds for distinguishing among instrumental use, resonant interaction, co-creation, and manifestations of integrated intelligence. The present methodology aims to bridge this gap through a systematic progression from theoretical definitions to observable processes, traceable inputs and testable conclusions (Dellermann et al., 2019; Seeber et al., 2020).

The guiding methodological question is: by what conceptual, logical, operational, and empirical criteria can it be established that a particular human–AI interaction (1) involves cognitive, creative, and emotional resonance, (2) takes the form of asymmetrical co-creation, and (3) reaches a level that can be interpreted as a manifestation of integrated intelligence?

The methodology assumes that integrated intelligence does not automatically arise from sustained dialogue, from using a generative model, or from obtaining a high-quality result. It requires process reconstruction, delineation of roles, tracking the transformation of contributions, and evaluation of alternative explanations. Humans and AI participate asymmetrically: (1) the human participant possesses intentionality, understanding, value judgement, and responsibility; (2) AI participates through analytical, generative, and context-transforming functions (Amershi et al., 2019).

1. Architecture and analytical levels of the methodology

The integrated intelligence research methodology is organised as an analytical architecture that connects the theoretical definition of the phenomenon with its observation, measurement, and empirical verification. It comprises five inter-dependent levels: ontological, logical, operational, measurement and empirical. These levels do not represent separate methodologies and should not be applied in isolation. Each of them performs a specific function in the overall research process, and the reliability of the conclusion depends on the consistency between them. These levels are described below.

The ontological level defines the subject of research and its conceptual boundaries. This level specifies what is meant by integrated intelligence, which of its characteristics are essential, and how its potential manifestation differs from the instrumental use of AI, automation, one-off content generation, or simple functional assistance. A key task is to prevent overextension of the construct, whereby any productive human–AI interaction could be wrongly designated as integrated intelligence.

The logical level translates the ontological definition into a system of necessary and supporting conditions for recognising the phenomenon. It specifies how purposeful dialogue, recursive transformation of contributions, cognitive, creative and emotional resonance, asymmetrical co-creation and preserved human responsibility should be connected. At this level, a logical structure is established through which it can be judged whether the observed configuration is compatible with the theoretical construct. Logical coherence is necessary so that a conclusion is not drawn solely on the basis of a single feature, such as a sustained dialogue, subjective usefulness, or high quality of the final product.

The operational level relates theoretical conditions to specific observable phenomena. It identifies the traces present in the dialogue, the successive versions of the product, and the decisions made by the human participant. Such traces may be a change in the initial conceptual framework, the emergence of a new search direction, a substantial revision of a machine proposal, a reasoned rejection of a generated variant, or the traceable inclusion of a distinguishable contribution to the final result. These traces can serve as evidence of resonance, transformation, and co-creation. The operationalisation should make it possible to distinguish between substantive transformation and superficial editing, mechanical acceptance, or random coincidence.

The measurement level assesses the degree, intensity and profile of the established processes. Its task is not only to give an overall value, but to show how the individual dimensions of the potential manifestation are distributed. For example, it is possible to account for strong cognitive resonance, moderate co-creation and weak emotional-communicative interaction. Profile measurement preserves the complexity of the phenomenon and limits the risk of different configurations being reduced to one undifferentiated metric.

The empirical level examines the extent to which the concepts, indicators, procedures and conclusions used are reliable, valid and applicable beyond the specific case analysed. It includes using independent raters, examining inter-rater reliability, analysing positive, negative, and borderline cases, as well as assessing content, construct, and discriminant validity. The framework needs to be applied to different participants, tasks, models, languages and organisational contexts. Only through such checks can one determine whether the indicators actually rec-

ognise integrated intelligence rather than general productivity, interaction satisfaction, or high product quality.

The five levels form a sequential but not linear system. The results of operational observation and empirical validation may require refinement of the logical conditions or even a rethinking of the ontological definition. The methodology therefore involves recursive feedback between theory, observation and verification. This makes it not only a procedure for applying a predetermined model, but also a means of gradually improving the theory of integrated intelligence itself.

Within this architecture, it is necessary to clearly distinguish four analytical activities: identification, measurement, evaluation and validation (Table 1). They answer different questions and lead to different kinds of conclusions. Identification determines whether the observed process is compatible with a manifestation of integrated intelligence. Measurement establishes the degree and profile of individual processes. Evaluation assesses the qualities of the final product; validation examines the reliability and validity of the criteria, data and conclusions used. Mixing these activities can lead to methodological error (e.g., accepting the high quality of a product as sufficient evidence of integrated intelligence without establishing how that product came about).

Table 1. *Delineation of analytical activities*

<i>Activity</i>	<i>Core question</i>	<i>Result</i>
Identification	Is there a configuration compatible with the manifestation of integrated intelligence?	Reasoned classification conclusion.
Measurement	To what extent are individual processes and dimensions manifested?	Profile or values by indicators.
Evaluation	What is the quality, originality or applicability of the product?	Evaluation against external criteria.
Validation	Are the criteria, data and conclusion reliable and justified?	Evidence of reliability and validity.

2. Subject, unit of analysis, and boundaries of the case

The subject of identification is the organisation of the specific human–AI interaction and the resulting product. The analysis explores the relational configuration in which human and machine-generated inputs are connected, evaluated, transformed, and incorporated into a coherent collaborative process. It should be emphasised that the analysis does not focus on human intelligence or on the technical capabilities of the model considered in isolation. The focus is both on what the participants can do individually and on how the organisation of the interaction changes the conditions for the occurrence of the specific result.

This distinction is methodologically essential. Human expertise, however high, is not sufficient evidence of integrated intelligence. Using an advanced generative AI model does not automatically imply co-creative interaction. It is possible for a high-quality result to be achieved primarily through human expertise, through one-off machine generation, or through instrumental assistance. Therefore, the analysis must establish whether the final product contains traceable evidence of a recursive transformation of distinguishable contributions and whether these transformations have significantly influenced the development of the interaction.

The basic unit of analysis is the co-creative episode. It represents a bounded and meaningful sequence of one or more loops: “human goal or input → AI output → human interpretation and transformation → new task or solution”. This sequence should not be understood as a mechanical and immutable scheme. In actual interactions, individual components may iterate, branch, or involve comparing several machine-generated variants, reverting to an earlier version, and reformulating the original goal.

The co-creative episode begins when a specific goal, problem, question, or intention can be identified that organises the subsequent exchange. It may begin with a specific task, the presentation of an initial idea, providing existing material, or formulating a difficulty that requires a solution. The essential thing is to be able to trace the relationship between the initial state of the task, the subsequent human and machine inputs, and the result reached.

The episode ends when a product or solution stabilises, when the goal changes substantially, when the work moves to another relatively self-contained problem, or when the interaction breaks down. Stabilisation does not necessarily imply final completion of the product. It marks a moment at which a relatively stable version is reached, a particular direction is taken, or a decision is made that allows the episode to be analysed as a meaningful whole. When the goal changes significantly, the next steps are treated as a new episode, even if it is part of the same project.

Determination of episode boundaries should be based on criteria formulated in advance. Appropriate criteria may be: changing the research question, moving to a new type of product, accepting or rejecting a decision, interrupting work or initiating a new line of enquiry. Clearly marking the beginning and the end is necessary to avoid selectively including only those parts of the dialogue that support the anticipated conclusion (Yin, 2018).

In an ongoing project, four nested analytical levels are distinguished: dialogic move, recursive loop, co-creative episode, and project. These levels provide varying degrees of analytical detail. The dialogic move allows the function of the individual contribution to be considered. The recursive loop shows the immediate

interaction between generation, evaluation and transformation. The co-creative episode encompasses a relatively complete developmental sequence. The project makes it possible to track persistent patterns and changes over time (Yin, 2018).

A dialogic move is the smallest observable unit. It may be (1) a human prompt, clarification, critical note, selection, edit, or (2) a machine-generated response, suggestion, analysis, or variation. A single move alone is rarely sufficient to draw an inference of resonance or co-creation. Its importance is determined by its function in the wider sequence, including whether it introduces a new distinction, changes the direction of work, provokes a critical reaction or participates in the transformation of the product.

A recursive loop involves a functionally related sequence of task, machine output, human evaluation, and subsequent transformation. The recursive loop is the principal level at which transformations across successive iterations can be observed. To establish it, it is not enough for the human participant to accept or copy the received answer. There needs to be a traceable interpretation, selection, correction, combination, reformulation or use of the output as a basis for new action. The subsequent machine contribution must also be related to the changed state of the task.

A co-creative episode brings together one or more recursive loops that have resulted in a relatively stable product, solution, or conceptual change. At this level, the analysis assesses whether the individual cycles form a coherent process, whether cognitive, creative or emotional resonance is observed and whether the machine contribution has a distinguishable functional role. The episode is the basic unit for identifying a putative manifestation of integrated intelligence because it combines process evidence with a specific outcome.

The project is a set of episodes united by a common goal. A project may contain episodes of varying degrees and profiles of resonance and co-creation. Some parts may demonstrate intensive recursive transformation, while others may represent routine editing, information retrieval, or technical support. Therefore, the presence of a highly pronounced co-creative episode is not enough to define the entire project as a manifestation of integrated intelligence.

Separation of levels prevents both over-generalisation and analytical fragmentation. Overgeneralisation occurs when all ongoing work is characterised as “integrated” based on a limited number of interactions. Analytical fragmentation occurs when individual moves are considered outside their functional relationships and the process of incremental transformation is thereby obscured. Multilevel analysis allows local manifestations to be interpreted in the context of overall project dynamics.

Case boundaries must include temporal, technological, and contextual parameters. The period of interaction, the model used and its version, basic settings

and instructions, access to external sources, task characteristics and relevant experience of the human participant should be documented. These factors can affect the process and are necessary for the correct interpretation, comparison and potential replication of the results.

A sufficiently complete evidentiary trail must be kept for each case analysed. It may include: the history of the dialogue, the successive versions of the product, notes on the decisions made, arguments for accepting or rejecting the proposals, a map of the contributions and the final result. Where some of this information is missing, it should be clearly stated how the limitation affects the classification conclusion.

The subject matter, units of analysis and case boundaries defined in this way allow integrated intelligence to be explored as a localised and demonstrable process manifestation, rather than as a generic quality attributed to a person, system or project. Table 2 summarises the individual analytical levels and the main sources of data through which they can be reconstructed and verified.

Table 2. *Units of analysis and data sources*

<i>Level</i>	<i>Definition</i>	<i>Basic evidence</i>
Dialogic move	A single human or machine-generated contribution.	Prompt, answer, note, choice or edit.
Recursive loop	A related sequence of assignment, output, evaluation, and transformation.	Dialogue chronology and sequential versions.
Co-creative episode	One or more cycles that resulted in a relatively stable product or solution.	Dialogue, versions, contribution map and final product.
Project	A system of episodes united by a common purpose.	Corpus, decision log, interim and final results.

3. Ontological and logical conditions

Integrated intelligence is conceptualised as a possible systemic manifestation of organised human–AI interaction. The term denotes a specific organisation of relations in which distinct human and machine-generated inputs engage in a recursive process of mutual transformation and lead to an outcome whose occurrence cannot be explained by considering the actors in isolation. It should be clarified that integrated intelligence does not represent an independent substance, a common consciousness, a fusion of human and machine intelligence, or the emergence of a new moral entity.

This formulation requires a clear distinction between the actors, the interaction, and the emergent systemic manifestation. The human participant remains

the bearer of intention, experience, value judgement and moral responsibility. Artificial intelligence participates through analytical, generative, transformative and contextually adaptive functions. This functional participation does not presuppose the presence of its own consciousness, autonomous will, or moral subjectivity. Integrated intelligence does not belong only to the human or only to the technical system. It manifests itself through the combination of their different capabilities and roles in a specific social and technological environment.

The relational nature of the construct means that explanation is primarily concerned with the structure, quality and dynamics of the relationships. It matters both what contribution each participant makes and how that contribution changes the conditions for subsequent actions. A machine-generated suggestion can prompt a human to make a new distinction, critical correction, or goal change. In turn, human interpretation and reformulation can lead to machine output that would not have occurred in the original assignment. Thus, each subsequent move is based on an already transformed state of the task.

Relationality does not imply symmetry between human and AI. The two parties participate differently and have different ontological and normative status. The human participant sets or accepts the goal, interprets the meaning of the propositions, evaluates their permissibility, and decides how to use them. Artificial intelligence can expand the space of possible solutions, suggest unexpected combinations, detect dependencies, and transform the given context. This functional difference is the basis for defining the interaction as asymmetrical co-creation rather than equal co-authorship.

Emergence means that the particular organisation of the process, or the resulting product, cannot be adequately explained by mechanically aggregating the isolated contributions. It is not enough for the human participant and the AI to add sequentially individual elements to a common result. It is necessary that contributions modify each other so that subsequent decisions depend on the history of the interaction. An emergent property arises when the product's form, structure, or semantic organisation emerges through recursive dynamics rather than being fully specified in advance by the human design or the initial machine output.

Emergence should not be automatically equated with novelty, complexity or high quality. A product can be original without being the result of a co-creative process, as well as being complex due to the accumulation of multiple generated elements. To speak of an emergent systemic manifestation, it must be shown how the interaction has led to a qualitative change in understanding, task organisation, or the space of possible solutions. Therefore, a claim of emergence requires process evidence, not just an evaluation of the final product.

The ontological framework places limits on the interpretation of emotional resonance. An AI's adaptive, supportive, or empathic-sounding response can influence human engagement and sustain the interaction. This influence is real as part of human experience and behaviour, but it does not prove that the technical system experiences emotions. Emotional resonance should be seen as a relational and communicative effect, not as evidence of symmetrical emotional experience.

The logical specification translates these ontological propositions into conditions for identifying a putative manifestation of integrated intelligence. Its function is to determine which signs must necessarily be established and which additional characteristics increase the validity of the conclusion. This prevents classification based on overall impression, subjective usefulness, length of dialogue or quality of the final product.

Conditions are divided into necessary and supporting. The necessary conditions outline the minimum configuration without which the claim of integrated intelligence cannot be defended. Supporting conditions increase confidence, indicate the intensity or profile of the manifestation, but the absence of a separate supporting condition does not automatically lead to a negative conclusion. The distinction prevents both overly broad and overly restrictive uses of the construct.

The first necessary condition is the existence of a definable purpose and context. It should be possible to identify what problem is being solved, what product is being created, or what understanding is being sought. The goal may be refined and transformed over the course of the interaction, but there must be sufficient semantic continuity to allow individual moves to be seen as parts of a common process. Without such continuity, a sustained exchange of messages does not constitute a co-creative episode.

The second necessary condition is the presence of meaningful input from both the human participant and the AI. Human input may include goal-setting, an original idea, expertise, criteria, criticism, selection, interpretation, or editing. Machine input must be functionally relevant to the development of the task and go beyond technical operations without meaning. Contributions need not be equal in volume, but they must be distinguishable and have a traceable role in the process.

The third necessary condition is the presence of at least one completed recursive loop. Asking a question once and accepting the answer is not enough. Machine output needs to be interpreted, evaluated, or transformed by a human, and that change participates in a subsequent task, solution, or product version. Recursion indicates that the interaction is not a one-way transmission, but a process in which the result of the previous move modifies the next state of the task.

The fourth necessary condition is human interpretation and critical processing. The human participant should not function solely as an operator who trans-

mits, receives, or mechanically assembles machine outputs. They must evaluate the meaning, accuracy, relevance and admissibility of the proposals, relate them to the objective and, if necessary, correct or reject them. Critical revision can be conceptual, structural, linguistic, methodological, or value-based, but it must leave an observable trace.

The fifth necessary condition is the traceable relationship between the interaction and the resulting product. It should be possible to show which ideas, decisions, structures or changes arose at specific points in the process and how they were incorporated into the final result. Traceability does not require that every word or item be attributed entirely to a single participant. It requires a sufficient genealogy of the product through which to reconstruct the role of individual contributions and their transformation.

The sixth necessary condition is human validation and retained responsibility. The final product acquires practical, scientific or societal validity only after human judgement, verification and decision about its use. Artificial intelligence cannot take moral, professional or legal responsibility for the result. Therefore, integrated intelligence implies not a weakening, but a strengthening of the requirements for human criticality, transparency and accountability.

The first supporting condition refers to the emergence of a new understanding. It can manifest itself by reformulating the problem, discovering an unsuspected dependency, changing an initial position or building a more comprehensive conceptual structure. The new understanding supports the claim of cognitive resonance when it can be related to specific transformations in dialogue rather than solely to the subjective sense of progress.

A second supporting condition is the expansion or transformation of the space of possible solutions. Artificial intelligence can suggest options, analogies or combinations that the human did not formulate beforehand, and human evaluation can rearrange them in a new direction. This supports the existence of creative resonance, especially when the final solution is not simply a selection from a ready-made list, but the result of successive combining, discarding and reworking.

Emotional engagement and process sustainability are also supportive in nature. These can be expressed in increased motivation, confidence to explore new directions, willingness to work for a long time or better handling of uncertainty. These signs are not sufficient to establish integrated intelligence, because they can also occur in a pleasant but superficial interaction. Their importance is determined by the relationship with cognitive and creative transformations.

A particularly strong supporting condition is evidence of a transformation that was not previously completed in any of the initial contributions. It can be a new conceptual scheme, argument, model, solution, or compositional structure

that emerges through the successive interplay of human and machine propositions. The claim is not supported solely by the internal abilities or intentions of the participants. The claim should be supported by a comparison between the initial state, the intermediate versions and the final product.

The necessary conditions are conjunctive in³ nature: the absence of any one of them weakens or excludes the classification of the particular episode as a putative manifestation of integrated intelligence. Supporting conditions have a profile character and can be presented with varying degrees of expression. For example, episodes with strong cognitive but weak emotional resonance, or with clear co-creation but limited product originality, are possible.

The conclusion must consider alternative explanations. The observed result may be due to prior human expertise, the quality of the initial assignment, replication of already known information, chance coincidence, or selective selection of successful machine suggestions. Identification therefore requires not only corroborating signs, but also verification that a simpler explanation adequately describes the observed process.

Ontological and logical conditions perform both a restrictive and a constructive function. They limit the unwarranted attribution of intelligence, consciousness, or authorship to the technical system, but at the same time allow the real functional role of machine input to be acknowledged. Thus, integrated intelligence can be studied as a specific systemic manifestation without erasing the differences between actors and without transferring human responsibility to technology.

4. Operationalisation of resonances

Resonance is operationalised as the mutually conditioned variation of successive human and machine-generated contributions within a particular dialogical process. It is not determined solely by thematic similarity, agreement between participants, duration of interaction, or subjective satisfaction with the resulting outcome. For resonance to be established, there must be observable evidence that the preceding contribution influenced the content, structure, direction, or evaluation of the subsequent contribution.

Reciprocity does not imply psychological, cognitive, or emotional symmetry between human and AI. For the human participant, change may take the form of a shift in understanding, intention, evaluation, criteria or creative decision. It may involve recognising a new problem, rejecting an initial assumption, formulating a different goal, or revising one's idea under the influence of a machine suggestion.

³ Here, "conjunctive" means that the conditions must be fulfilled simultaneously and jointly: they are related by the logical "AND", not "OR".

In AI, change is observed functionally—as a change in the subsequent output in response to accumulated context, human feedback, new instructions, or interim versions provided by the human participant.

Resonance attribution is based on observable changes in interaction rather than assumptions about the internal states of the technical system. Research should not claim that AI understands, experiences or creates in human ways. Analytically relevant is whether the system generates contextually modified input that participates in the formation of subsequent human decisions, and whether these decisions in turn modify subsequent machine generation.

Operationalisation requires that resonance be viewed as a process rather than a one-off event. An isolated strong response, an original idea, or a persuasively worded interpretation can be helpful, but they are not sufficient to establish resonance. At least one recursive loop must be followed in which the input is interpreted, evaluated, or transformed, and the result of this processing is fed back into the subsequent interaction.

The primary evidence is the change between successive task states. Therefore, the analysis should compare the original problem statement, machine outputs, human responses, intermediate versions, and the final product. Any claim of resonance must be linked to a specific chronological and substantive trace: what the starting point was, which input caused the change, how the human participant interpreted it, and how it affected the next cycle.

The three resonances, namely cognitive, creative, and emotional, represent distinguishable analytical dimensions. They can occur simultaneously, sequentially or independently of each other. Strong cognitive resonance does not necessarily imply creative novelty, and emotional engagement does not prove a shift in understanding. Their separate coding is necessary to establish the specific profile of the interaction and not to form a general positive conclusion based on one highly expressed aspect.

Cognitive resonance refers to a traceable change in the understanding and conceptual organisation of a task. Its indicators should show that the interaction has led to a new distinction, a reformulation of the problem, a change of assumption, the establishment of a connection between previously unrelated elements, or a reasoned correction. It is not only the appearance of new information that is essential, but its integration into a changed structure of understanding.

Creative resonance refers to the transformation of the space of possible solutions. It can manifest itself through the generation and subsequent revision of variants, the discovery of unexpected connections, the combination of different ideas, the modification of initial criteria, or the development of an idea through several recursive loops. For creative resonance, it is not enough for the AI to offer an original variant. It is necessary for this variant to be interpreted and used as material for further transformation.

Emotional resonance refers to the impact of an interaction on human engagement, motivation, confidence, trust, and willingness to continue working. It can be observed through self-reports, changes in tone, increased detail in tasks, continuation of the dialogue after a difficulty, or the adoption of a more complex direction of inquiry. These signs should be interpreted carefully because they may also reflect general satisfaction, interface convenience, or system anthropomorphisation.

The observable indicators and the limitations of their interpretation are summarised in Table 3.

Table 3. *Operational indicators of the three resonances*

<i>Dimension</i>	<i>Observable indicators</i>	<i>Limitation of interpretation</i>
Cognitive resonance	New distinction; reformulating the problem; change of assumption; higher conceptual connectivity; reasoned correction.	It does not come down to agreement or linguistic fluency.
Creative resonance	Expansion of variants; unexpected connections; recombination; changing the criteria; development of an idea over several cycles.	Not identical to the originality of a single machine output.
Emotional resonance	Self-report of understanding, confidence, motivation, or inspiration; change of tone; continuing and deepening the dialogue; functional response adaptation.	Does not imply human-like AI emotional experience.

The presented indicators have a guiding rather than automatic classification function. The presence of a separate indicator is not sufficient to conclude resonance. For example, a reformulation of a problem may represent only a linguistic edit, and the continuation of the dialogue may be due to ambiguity or frustration. The analyst must establish the function of the change in the specific context and its relationship to the subsequent development of the task.

Each indicator should be coded based on a clearly defined unit of evidence. It can include a specific dialogic move, a related pair of human and machine inputs, an entire recursive loop, or a comparison between successive versions of the product. Coding should indicate not only the type of resonance assumed, but also the initial state, the observed change, the contribution that caused it, and its impact on subsequent actions.

Cognitive resonance should not be attributed simply because the machine response is logically ordered, informative, or coincides with the human position. Consent can confirm an existing understanding without changing it. Stronger evidence is available when the human participant formulates a new conceptu-

al relationship, revises an assumption, introduces a more precise distinction, or changes the structure of the argument based on the interaction.

Creative resonance must be distinguished from a mere increase in the number of variants. Generating multiple suggestions may expand the choices, but does not necessarily indicate a transformation of the creative space. Stronger evidence is present when proposals cause a change in criteria, a combination of previously unrelated ideas, or the development of a solution that is not fully formed in either the human conception or the original machine output.

Emotional resonance requires the most careful interpretation. Self-reports of confidence, inspiration, or sense of understanding provide information about human experience, but do not prove product quality or the presence of cognitive and creative transformation. High trust can be both a resource for sustainable interaction and a risk if it reduces critical scrutiny and increases the tendency to accept inaccurate or inappropriate proposals.

Changing the tone of a machine response is also not independent evidence of emotional resonance. It can be technically triggered by an instruction concerning style or by accumulated context. Analytical significance arises when the adapted response affects human motivation, confidence, or willingness to rework the task, and this change can be supported by additional process data.

The three types of resonance can form different configurations. Cognitive resonance can spark creativity when new understanding opens up different solutions. Creative resonance can increase motivation and support emotional engagement. Emotional engagement can increase the duration and depth of work by creating the conditions for subsequent cognitive transformations. These relationships should be investigated empirically rather than assumed as a universal causal sequence.

Negative or dissonant resonance must also be allowed. Machine input may cause confusion, conceptual bias, over-extension of options or undue reliance. Such effects also represent mutually conditioned change, but do not support a positive evaluation of the process. Therefore, the type, direction, and consequences of change should be coded separately from the mere presence of an interaction.

Creativity, creative stimulation, and creative resonance are operationalised and coded as related but distinct phenomena. Creativity refers to an ability or quality that can be related to a person, process or product. For a product, it is usually judged by originality, relevance, utility and sophistication. This assessment is consequential and does not in itself establish how the product came about.

Creative stimulation refers to the impact of machine-generated options, analogies, or questions on human thinking. It can expand attention, activate new associations, or help overcome a creative block. Stimulation can also arise from a

single machine output, without a subsequent recursive process. As such, it is a potential precondition for creative resonance, but it is not identical with it.

Creative resonance implies recursive transformation. The machine-generated variants are interpreted, selected, combined, modified or rejected by the human, and the result of this work feeds back into the dialogue and influences the next machine input. It is this traceable mutual change that distinguishes creative resonance from the passive receipt of ideas and from choosing between alternatives generated in advance.

The source of the initial impulse, the type of human processing, the change in subsequent machine output and the effect on the product must be separately noted in the coding. Thus, it can be established whether AI performs the function of a variant generator, a critical interlocutor, a transformative mediator, a structuring tool or a co-creative participant. The functional role may change in different cycles of the same episode.

Reliable operationalisation requires the use of positive, negative, and borderline examples. Positive cases show a clear recursive transformation; negatives include interactions with no significant change; borderline ones contain separate indicators, but do not provide sufficient grounds for a definite conclusion. Comparing them helps to refine the coding rules and reduces the risk that any productive dialogue will be identified as resonant (Krippendorff, 2018).

The final score should not be based on a mechanical count of indicators. Their consistency, interrelationship, intensity and role in product development are important. The profile approach is more justified, where for each resonance the available evidence, the degree of manifestation, the limitations of the interpretation and the confidence of the evaluator are described. Thus, the three resonances are transformed from general theoretical categories into observable, comparable and empirically verifiable process dimensions.

5. Criteria for asymmetrical co-creation

Asymmetrical co-creation refers to a form of interaction in which the human participant and the AI jointly participate in the creation and transformation of a particular product. However, humans and AI are not equivalent in their nature, ways of knowing and moral responsibility. Asymmetry is not a disadvantage of the interaction; it is one of its defining conditions. The human participant contributes through goal-setting, interpretation, experience, expert and value judgement, critical examination, and taking responsibility. Artificial intelligence participates through analytical, generative, structuring, and transformational functions dependent on the provided data, instructions, and accumulated context.

The role of AI is defined according to its functional and traceable contribution to the process. It does not depend on assumptions about human-like con-

sciousness, intentions, experiences, or autonomous will. The question is not whether the system “wants” to create the product or “understands” its meaning in a human way. What matters is whether the AI contribution is content-relevant and participates in the recursive development of the task. It is also important whether it changes the space of possible solutions and leaves a reconstructable trace in the final result.

The functional definition allows the real contribution of AI to be recognised without equating the technical system with a human author or moral subject. An artificial intelligence may perform a co-creative function in a particular process, but it does not follow that it possesses a general capacity for creativity, an independent authorial intent, or a right of academic authorship. The co-creative function is local, relational and dependent on the specific organisation of the interaction.

Locality means that a co-creative role is established for a specific episode, product, or solution and is not permanently attributed to the system. The same model can perform a co-creative role in one episode and an instrumental role in another. For example, in the development of a conceptual framework, the AI may suggest a new distinction that can be repeatedly revised and incorporated into the final model. In subsequent spell-checking, the same system performs an auxiliary rather than a co-creative function.

The relational nature means that the function of the machine input cannot be determined outside of human interpretation and subsequent use. An original machine output is not sufficient for co-creation if it remains unused, mechanically copied or unrelated to the development of the task. The same output can take on co-creative significance when it causes a change in the human position, leads to substantial transformation, and participates in subsequent recursive loops.

Co-creation should be distinguished from technical assistance. When providing assistance, the AI performs a predetermined operation without significantly changing the content or direction of the work. Such functions can be spelling correction, formatting, file conversion, retrieval of predefined data or text truncation according to clear instructions. They can increase efficiency, but they do not necessarily expand the solution space and do not participate in the conceptual development of the product.

A distinction is also needed between co-creation and creative stimulation. In creative stimulation, the machine output activates human associations, helps overcome a difficulty, or suggests options, but the further solution is primarily developed by the human and does not involve substantial recursive exchange. The stimulating function may be an important prerequisite for a co-creative process, but it does not in itself prove that the AI was involved in the transformation of the final product.

The resonator function is present when machine input reflects, structures, extends, or questions human ideas and thus helps to clarify them. Artificial intelligence can act as an analytical mirror, a critical interlocutor, or a means of explicating vague assumptions. The resonator function comes close to co-creation, but remains more limited when the contribution affects human understanding without leaving a sufficiently distinguishable and traceable role in the product itself.

Determining a co-creative function requires evidence that shows how a process was performed, not just what the end result was. The quality, originality or usefulness of the final product is not enough, because a similar result can be achieved by independent human work, by one-off generation or by choosing between ready-made options. One must reconstruct how the machine input originated, how it was interpreted and reworked, how it influenced subsequent decisions, and how much of its impact is retained in the final result.

Four criteria can serve to reach a strong conclusion about the presence of asymmetrical co-creation: distinguishable contribution, iterative transformation, impact on the decision space, and traceable⁴ role in the product. The criteria are analytically distinct but functionally related. Each checks a different aspect of the process and limits a different type of unreasonable conclusion.

The first criterion is the presence of a distinguishable and meaningful machine contribution. It examines whether AI adds an element that goes beyond mechanical repetition, paraphrasing or linguistic smoothing of the human task. Positive evidence may include a new conceptual relationship, variant, model, argument, critique, structure, analogy, or question that has functional significance for the development of the task.

Distinctiveness does not mean that a contribution is completely independent of human context or created “out of thin air”. Each machine output is conditioned by the task, data, and dialogue history. The criterion requires that the contribution cannot be sufficiently described as a direct reproduction of content already provided. It needs to introduce a transformation, extension, juxtaposition or structuring that alters the available material.

The significance of the contribution is assessed against the specific objective, not against its volume. A short question or distinction may have more co-creative value than a lengthy generated text if it changes the direction of the analysis. Conversely, a large amount of content may remain functionally irrelevant when it is not used or does not influence subsequent decisions.

The second criterion is iterative transformation. It examines whether the machine input participates in one or more subsequent cycles and whether in the

⁴ Here, “decision space” refers to the set of possibilities from which the most appropriate solution can be selected.

process it is modified by human interpretation, criticism, selection, combination or reformulation. For co-creation, it is not enough for an AI to provide a one-off finished result that a human can accept without significant reworking.

Iterability implies the ability to trace a sequence of mutually conditioned changes. The machine proposal can be partially accepted and corrected; human correction can lead to a new assignment; the next machine output may suggest a different structure to be evaluated and modified again. Thus, the product develops through cycles in which the outcome of each stage becomes an input to the next.

The number of cycles alone does not prove an iterative transformation. Prolonged dialogue may include repetition, clarification of wording, or a series of unrelated requests. Of analytical importance is the quality of the relationship between the cycles: whether each subsequent stage uses and transforms the result of the previous one, and whether development rather than mechanical accumulation is observed.

The third criterion is the impact on the decision space. It examines whether machine input changes the options considered, the selection criteria, the problem formulation, or the direction of the search. Positive influence can be manifested by introducing a new alternative, discovering a missed assumption, proposing a different structure, or questioning a previously chosen strategy.

A solution space change can be expanding, limiting, or transforming. Expanding influence adds new possibilities. A limiting influence helps to reject inappropriate variants through arguments or criteria. A transformative influence changes the very understanding of the problem and leads to the formulation of a different class of solutions. All three forms can be co-creative if they are content-relevant and traceable.

Not every increase in the speed of work is an influence on the solution space. If the AI only performs an already fully defined operation faster without changing the capabilities or criteria, the contribution remains instrumental. Effectiveness is an important practical outcome, but it is not independent evidence of co-creation.

The fourth criterion is the traceable role of machine input in the final product. It checks whether AI influence can be reconstructed through dialogue history, sequential versions, decision notes, or a contribution map. Traceability links the process to the result and allows the claim of co-creation to be independently verified.

A traceable role does not necessarily imply the verbatim presence of machine-generated text. The input may be conceptual, structural or critical and be retained in the product in a transformed form. For example, an AI proposal may be completely revised at the linguistic level, but remain recognisable as a new logical structure or research direction. In such a case, the chain of transformations must be documented.

The lack of a literal match does not rule out co-creation, but the lack of a reconstructable link greatly weakens the conclusion. A participant's retrospective claim that AI "made an impact" is insufficient without supporting data. The more complete the evidentiary history, the higher the confidence in the classification can be.

The four criteria are jointly necessary for a strong inference of an AI co-creative function. A distinguishable contribution without iterative transformation can be an original but one-off machine output. Iterative interaction without changing the solution space can represent a lengthy edit. The impact on decisions without a traceable link to the product remains difficult to verify. The traceable presence of machine text without a meaningful and transformative contribution can be a mechanical inclusion.

The joint necessity of the criteria does not imply the same degree of manifestation. Different co-creative episodes can have different profiles. In a conceptual task, the influence on the decision space can be leading. In the creation of a visual or text product, the iterative transformation and traceable role can be more clearly manifested. The assessment should take into account the specifics of the task without overriding the minimum threshold for each criterion.

Partial fulfilment allows for a more cautious and differentiated definition. In the presence of a distinguishable contribution without subsequent recursive processing, it is appropriate to speak of generation or creative stimulation. In the case of continuous adaptation that aids human understanding but leaves no traceable role in the product, the term „resonator function" can be used. In the case of technical implementation of a predetermined operation, the term „assistance" is more correct.

In uncertain or borderline cases, the analyst should not impose a binary classification. It is possible for the conclusion to be formulated as "limited evidence of a co-creative function", "partial fulfilment of the criteria" or "predominant instrumental support with individual co-creative elements". Such a graded assessment more accurately reflects the complexity of real-world interactions.⁵

The criteria apply to the specific co-creative episode, not automatically to the entire project. Within a continuous work, AI can successively perform different functions: source of information, technical assistant, generator of variants, critical resonator and co-creative participant. The functional role must be determined separately for each analytically distinguished episode.

The assessment must also consider alternative explanations. Seemingly new machine input may derive directly from detailed human input; the human partic-

⁵ Here, "binary classification" means dividing cases into two mutually exclusive categories; that is, each item belongs to one of two possible groups (e.g. "yes/no", "present/absent" or "positive/negative").

ipant may have decided on the change in advance; the final product may contain machine-generated text without affecting the conceptual organisation. Therefore, any positive conclusion must be supported by evidence that distinguishes the co-creative function from simpler forms of participation.

Asymmetrical co-creation does not diminish human responsibility. On the contrary, the more substantial the machine input, the greater the need for critical review, documentation, and clear human validation. The human participant is responsible for selecting the goal, using the system, accepting or rejecting the suggestions, checking the result and the consequences of its application.

Thus, the four criteria perform a dual function. They allow the significant and transformative involvement of AI to be recognised without attributing unproven human characteristics to it. At the same time, they set a sufficiently strict threshold that distinguishes asymmetrical co-creation from assistance, automation, one-off generation and general creative stimulation.

Table 4 systematises the proposed criteria, possible control questions, and types of positive, negative, and borderline evidence used in determining the co-creative function of AI.

Table 4. *Criteria for the co-creative function of AI*

<i>Criterion</i>	<i>Control question</i>	<i>Positive evidence</i>	<i>Negative/borderline case</i>
Distinguishable contribution	Does the AI add a meaningful element beyond the mechanical repetition of the task?	New relationship, variant, pattern, critique, or structure.	Paraphrasing, template, or non-substantive editing.
Iterative transformation	Does the contribution participate in and change through subsequent cycles?	Versions in which human and machine inputs are transformed through their interaction.	One-off output with no further development.
Influence on the decision space	Does the contribution change the options considered or the criteria?	New direction, alternative, or rethought assumption.	Only acceleration of an already determined solution.
Traceable role in product	Can the influence be reconstructed in the final result?	Dialogue history, versions and contribution map.	No connection between output and product.

6. Identification and coding procedure

The identification and coding procedure translates the ontological, logical and operational positions of the methodology⁶ into a sequence of practical analytical actions (Table 5). It begins with a clear delimitation of the studied case and ends with a reasoned conclusion about the nature of the observed interaction. Its purpose is to make the analysis transparent, traceable and reproducible, so that the conclusion does not depend solely on the general impression or subjective judgement of the individual analyst.

The procedure should clearly distinguish between identification, measurement and evaluation. Identification answers the question of whether a configuration compatible with a manifestation of integrated intelligence is present in the particular episode. Measurement determines the degree and profile of individual resonances and co-creative criteria. Evaluation refers to the quality, originality, accuracy, applicability or soundness of the product. The three activities are related, but the results of one cannot automatically replace the evidence needed for the others.

A high-quality product is not sufficient evidence of integrated intelligence. This is because it may result from prior human expertise, from one-off machine output, or from technical assistance without substantial recursive transformation. Similarly, having a rich co-creative process does not necessarily guarantee high product quality. The analysis must allow for the possibility of a strong interaction producing an unsatisfactory result, as well as a high-quality result produced without established co-creation.

The procedure is applied to a predefined unit of analysis. Depending on the goal, this can be a recursive loop, a co-creative episode or a system of episodes within a project. For a strong classification conclusion, it is recommended that the basic unit be the co-creative episode, because it allows the sequence of interaction, the observed transformations and the relatively stable product or solution to be related.

Before the coding itself begins, the analytical protocol must be established in the form of a structured document or record that systematically describes how the analysis was performed and what results were obtained. It should include working category definitions, inclusion and exclusion rules, episode start and end criteria, rating scale and evidence requirements. When these decisions are made only after the review of the result, there is a risk that the categories will be

⁶ Three interrelated groups of prerequisites are considered here: ontological (what exists and what the nature of the object under study is), logical (how scholarly knowledge is reached and conclusions are drawn) and operational (how the research is conducted in practice, including the methods, tools and procedures used). Together, these three levels ensure consistency between the philosophical foundations of the research, the mode of reasoning and its practical implementation.

adapted to the expected conclusion. Their prior formulation limits confirmatory bias and facilitates independent replication of the analysis (Krippendorff, 2018).

The first stage is to delimit the case. The analyst must determine the task, purpose, context, participants, system used, time scope, start and end of the interaction, and the product to which it is directed. Relevant characteristics of the environment should also be documented: model version, basic instructions, settings used, access to external sources, and presence of additional human participants.

Case boundaries should be narrow enough to allow detailed tracing, but broad enough to encompass a functionally complete process. If only a single impressive response is analysed, the lack of subsequent transformation may be missed. If the whole project is included without distinguishing the episodes, local manifestations may be unjustifiably generalised as a feature of the whole work.

The beginning of an episode is defined by the emergence of a specific goal, problem, question, or creative intent. Its end is associated with the stabilisation of a product, the adoption of a decision, a significant change of purpose, or the termination of an interaction. When a new relatively independent problem arises during the course of work, it should be separated as a new episode, even if it belongs to the same larger project.

The second stage is the collection and organisation of the evidence base. It can include the full history of the dialogue, successive versions of the product, human notes, a decision log, external sources used, test results, self-reports and the final product. The data should allow a chronological reconstruction of the interaction and tracing of the relationship between the individual contributions and the subsequent changes.

Preference should be given to the complete interaction corpus. When selection is used for practical or ethical reasons, the selection rules must be explicitly stated and justified. It is not permissible to include only the successful or most impressive parts of the dialogue, because this creates a distorted view of the consistency and efficiency of the process.

Data must be stored in a form that preserves its chronology and provenance. It should be clear which input is human, which is machine-generated, when and where it occurs in the sequence, and which version of the product it relates to. In the case of edited or merged records, the original version should also be preserved so that the origin and development of each change or transformation—its genealogy—remain traceable.

The third stage is the segmentation of the material. Dialogue is divided into moves, recursive loops and co-creative episodes. Segmentation should not be based only on technical boundaries between messages. An analytical segment can contain several functions, and a recursive loop can span a series of messages related to a common transformation.

For each segment, its function, relationship to the previous contribution and consequences for the next stage are noted. A human contribution can serve the function of goal-setting, evaluation, criticism, selection, revision, or validation. Machine input can act as suggestion, analysis, structuring, criticism, variant expansion, or functional adaptation. The same contribution may have more than one function, but each coded function must be justified.

The fourth stage is the coding itself. The analyst evaluates the manifestations of cognitive, creative and emotional resonance, as well as the fulfilment of the criteria for the co-creative function of the AI. Each code set must be associated with a specific quote, action, change between versions, or other observable evidence. General statements such as “dialogue is productive” or “AI makes a significant contribution” are not sufficient without specific supporting evidence.

The code needs to describe both the presence of the indicator and the direction of the change. For example, reformulating the problem may lead to greater conceptual clarity, but it may also divert the analysis from its original purpose. Generating additional options can expand the creative space, but it can also create information overload. Emotional adaptation can support commitment, but also reinforce uncritical trust.

Both positive and negative, borderline and conflicting evidence should be recorded when coding. Positive evidence supports a particular code or criterion. Negative evidence indicates the absence of the expected manifestation or the presence of a process incompatible with it. Borderline evidence provides partial or weak traceable support. Conflicting evidence suggests that different sources or parts of the process lead to inconsistent interpretations.

Failed, rejected and irrelevant machine proposals are particularly important. They show that the human participant does not automatically accept generated outputs, but exercises critical judgement, selection and control. At the same time, an excessive number of rejected proposals may mean that AI has a limited functional role and that the end result is mainly due to human work. Rejection is not automatically either a positive or a negative sign; its significance depends on its function within the process.

Failed proposals can also have a productive role. An inappropriate machine variant can help a human refine the criteria, recognise a hidden assumption, or more precisely articulate the goal. In such a case, the input is not directly involved in the product, but may have a cognitive or resonator function. This function should be coded separately from the traceable co-creative role in the final result.

The fifth stage is triangulation. It involves comparing different sources of evidence: the dialogue history, the successive versions, the participant’s self-report,

the decision diary, and the external evaluation. The aim is to determine the extent to which these sources support, complement, or contradict one another.⁷

Self-report can provide information about change in a person's understanding, intention, motivation, or sense of creative stimulation. However, the results are likely to be influenced by hindsight bias, social desirability, and anthropomorphisation. Therefore, self-report should not be treated as independent evidence when the relevant claims can be verified through the analysis of the dialogue and the successive versions of the product.

The dialogue history shows the immediate sequence of contributions, but does not always reveal the reasons for human choice. Successive versions show how the product has changed, but may miss rejected alternatives. External evaluation allows an independent assessment of quality, but does not necessarily have access to the internal logic of the process. Triangulation uses the strengths of each source and compensates for its limitations.

Contradictions between sources should not be removed by mechanical averaging. If the participant reports a strong conceptual shift, but the dialogue and versions show no trace, the conclusion should be cautious. In the event that the external evaluator finds the product unoriginal, but the process contains clear evidence of creative resonance, the quality of the product and the nature of the interaction must be distinguished.

The sixth stage is evaluating the strength of the evidence using a scale from 0 to 3. The scale measures the extent to which a particular indicator or criterion is supported by the data. Each dimension should be assessed separately, with a brief explanation and reference to the relevant evidence attached to the value.

A value of 0 means that the manifestation is absent or that the available data contradict its presence. It should not be automatically awarded when information is insufficient. Absence of data and proven absence are different states and should be distinguished in the coding scheme.

When the evidence base does not allow an assessment, it is recommended to use a separate designation, for example "ND"—insufficient data or "not evaluable". This prevents the score from being artificially lowered and allows you to specify what additional information is needed. A value of 0 should be used only when the material analysed is sufficient for a negative conclusion.

A value of 1 indicates limited, single, or poorly traceable occurrence. There may be a single indicator that does not participate in a complete recursive loop, or a claim supported primarily by a single uncertain source. This value indicates a possible manifestation, but does not allow a confident conclusion.

⁷ Here, "triangulation" means that the same phenomenon is investigated using more than one source, method, researcher or theoretical perspective in order to increase the credibility and reliability of the results.

A value of 2 indicates a clear manifestation supported by specific, traceable evidence. It is necessary to be able to point to a specific quote, action, change between versions, or other reliable source. A manifestation is distinct at a particular point in time or cycle, but may not have sufficient repeatability or independent support to be defined as persistent.

A value of 3 indicates a persistent manifestation observed in more than one segment, confirmed by more than one source, or independently verifiable through interaction history and product versions. This value requires consistent evidence and the absence of significant unexplained contradictions. A large number of repetitions alone is not sufficient if they reproduce the same weakly significant phenomenon.

The scale can be applied by profile, assigning separate values to cognitive, creative and emotional resonance and to each co-creative function criterion. It is not advisable to automatically sum them into a single overall result, because different configurations may have different theoretical meanings. An episode with strong cognitive resonance and weak emotional engagement is not equivalent to the opposite (weak cognitive resonance and strong emotional engagement), even if the sum is the same.

If a common index is used, its logic must be justified in advance and empirically validated. Prerequisites and supporting indicators should not be given equal weight by default. High values of supporting features cannot compensate for the absence of a necessary condition, for example, the absence of human critical processing or a traceable link to the product.

The seventh stage is the formation of a conclusion. It should indicate whether the necessary conditions are met, what the profile of the resonances is, how well the criteria for a co-creative function are supported, and what limitations the evidence base has. The conclusion should not be just a label, but a brief reasoned reconstruction of the process.

Instead of a single binary decision of “there is” or “there is no” integrated intelligence, several degrees of confidence can be used: lack of evidence; limited or borderline evidence; a configuration consistent with a putative manifestation; strongly supported hypothesised manifestation.

When the criteria are only partially met, the interaction should be more precisely defined as instrumental assistance, generative assistance, creative stimulation, resonator function, or a mixed configuration. This does not constitute a negative evaluation of the usefulness of the process. It shows that the available evidence supports a different type of interaction.

The eighth stage is the verification of the reliability of the coding. In studies involving more than one analyst, it is necessary to code at least some of the empirical material independently by each analyst, then assess the degree of inter-

rater agreement. Disagreements should be used to refine definitions, indicators, and examples, not just resolved through discussion without documentation.

Prior to the main study, pilot coding of positive, negative and borderline cases is recommended. This makes it possible to identify which categories overlap, which indicators are too general, and which types of data are uncertain. The coding manual should be updated based on pilot results, with changes documented.

The procedure must also provide for an audit trail. An external researcher must be able to trace how the primary data lead to a specific code and from the codes to the general conclusion. For this purpose, it is necessary to maintain a register containing the identifier of the episode, the citation or reference to the evidence, the judgement code, the value, the reasoning, the alternative interpretation and the degree of confidence.

Ethical and legal requirements are part of the procedure, not an afterthought. Dialogues may contain personal data, confidential information, proprietary material or sensitive information. Before archiving and analysing data, it is necessary to establish clear rules regarding informed consent, anonymisation, mode of access, storage conditions and the manner of data presentation. The need for traceability does not negate the obligation to protect participants and affected persons.

The final report must present not only the results but also the limitations of the procedure. These may include an incomplete archive, lack of interim versions, reliance on self-reporting, unclear episode boundaries, model change during the project, or insufficient independent coding. Limitations should be related to their specific impact on the confidence of the conclusion.

Thus, the procedure transforms the identification of integrated intelligence from an intuitive assessment into an evidence-based analytical process. Case delineation, systematic data collection, segmentation, coding, triangulation, profile assessment and reliability checking form a linked sequence. Table 5 summarises the main stages and the coding scale.

Table 5. *Coding procedure and scale*

<i>Stage/value</i>	<i>Contents</i>	<i>Requirement</i>
1. Delimitation	Defining task, context, participants, system, beginning, end, and product.	Unique unit of analysis.
2. Compilation	Archived dialogue, successive versions, notes, external checks, and the final product.	Complete or judiciously selected evidence base.
3. Coding	Evaluation of resonance and co-creation criteria.	Specific citation, action, or change for each code.

<i>Stage/value</i>	<i>Contents</i>	<i>Requirement</i>
4. Triangulation	Comparison of dialogue, versions, self-report and external assessment.	Marking coincidences and contradictions.
5. Conclusion	Determination of interaction type, manifestation profile, and confidence.	Reasoned relationship between codes, negative evidence and classification.
ND - insufficient data	The evidence base does not allow a reliable assessment.	Does not equate to a value of 0 and does not automatically participate in an overall score.
0 – absent	The data indicate the absence of the manifestation or actively contradict it.	Awarded only if there is sufficient basis for a negative conclusion.
1 – limited	Single or poorly traceable manifestation.	Partial evidence.
2 – clear	A clear manifestation supported by specific, traceable evidence.	At least one reliable evidentiary source.
3 – sustainable	Consistent occurrence in more than one loop or source.	Convergent and independently verifiable traces.

7. Process and outcome criteria

Identifying a co-creative process and evaluating the resulting product are related but methodologically distinct tasks. The first focuses on how the interaction between human participants and AI develops, and the second on the qualities of the resulting product. The distinction is necessary because the high quality of the product does not automatically prove co-creation, just as the presence of a co-creative process does not guarantee a successful outcome.

A high-quality product can be obtained through the one-off instrumental use of AI. A well-formulated assignment can produce accurate, original, or practically useful machine output that humans can accept with minimal changes. In such a case, the product may have high value, but the process does not contain sufficient evidence of recursive transformation and asymmetrical co-creation. The opposite is also possible. The process can involve continuous feedback, cognitive and creative resonance, mutual transformation of inputs and clear distribution of decisions. Yet it may still result in an inaccurate, incomplete, or practically unworkable product. The reason could be, for example, incorrect initial information, insufficient expertise, an inappropriate selection criterion, a limitation of the model, or failed human validation.

Co-creativity is a characteristic of the organisation of the process, and quality is a characteristic of the result when assessed against specified external criteria. A positive relationship may exist between them, but it needs to be investigated empirically. It is not correct to infer the existence of co-creation solely from the originality, accuracy, usefulness or complexity of the final product.

Process tracking criteria derive from the dynamics and evolution of human–AI interaction. They cover recursive loops, the transformation of human and machine input, and the use of feedback. They also include the manifestations of cognitive, creative and emotional resonance, as well as the distribution of decisions between the human participant and the system. The analysis is not limited to establishing these characteristics. It examines their function and their contribution to the task-solving process.

Recursiveness reflects the degree to which the results of previous moves are used as input conditions for subsequent stages of the interaction. This involves more than a consistent exchange of messages. It is necessary for the human to evaluate or process the machine output. On this basis, the human participant formulates a new assignment, makes a decision or creates a new version. This input, in turn, influences the next machine-generated result.

Transformation refers to substantive changes in contributions. A machine proposal can be supplemented, combined, limited, critically reformulated, or used as a basis for a new direction. A human idea can also be structured, expanded or questioned by machine output. When contributions merely accumulate without mutual modification, evidence for a co-creative process remains limited.

Feedback must have a functional role. Generic responses such as “go on”, “do it better”, or “give more options” can support dialogue but do not always indicate critical revision. Stronger evidence is present when the feedback contains a reasoned assessment, a change in a criterion, the identification of a problem, or the introduction of a new distinction that affects the subsequent outcome.

Resonance indicates whether an interaction changes understanding, the decision space, or human engagement. Process analysis establishes the type, direction, and intensity of this change. Positive resonance supports the development of the task. Dissonance can lead to confusion, loss of focus, or overconfidence in the system.

The allocation of decisions shows who defines the objectives and criteria, chooses between the possible options, performs the checks and approves the final product. Through this indicator, the asymmetry in the interaction is established. Artificial intelligence can influence decisions through analysis and suggestions. However, the final meaning-related, value-based, and practical judgement must remain demonstrably human.

Outcome criteria evaluate the relatively stabilised final product. Depending on the nature of the task, it may be a text, conceptual model, solution, plan, image, prototype, computer program, or other artefact. The criteria must take into account its purpose and function. As far as possible, the evaluation of the product should be independent of the evaluation of the process of its creation.

Originality indicates the extent to which the product includes non-trivial ideas, combinations or solutions. It is not equivalent to being unusual. The new element must fit the purpose and have a semantic or functional value. Evaluation is more reliable when done by independent evaluators or by comparison with an appropriate corpus of solutions.

Justification is determined by the logical sequence of the statement, the quality of the argumentation and the availability of relevant data or sources. The persuasive tone of machine-generated text alone does not prove its validity. It is necessary to check whether the statements derive from the stated grounds and whether the conclusions drawn are logically supported.

Accuracy indicates how closely the result conforms to verifiable facts, correct calculations, reliable sources, applicable regulatory requirements, and technical specifications. It is particularly important in scientific, medical, legal, financial and technical tasks. In these areas, even small inaccuracies can have serious consequences. Accuracy is therefore assessed independently of linguistic quality, stylistic consistency and the confidence with which the output is presented.

Applicability indicates how well the product can fulfil its purpose in specific conditions. It depends on its practical feasibility, available resources and its comprehensibility for the target audience. Compliance with organisational, ethical and legal constraints is also important. Even an original product can have low applicability if it does not consider the real context.

Conceptual integrity indicates the extent to which the individual parts of the product form a coherent structure. It presupposes consistency of concepts and absence of internal contradictions. It is important to have a clear connection between the purpose, argument and conclusion. The different representations of the result must also match. This criterion is particularly important for products that combine multiple human and machine inputs.

Process and outcome measures should be assessed separately and then compared. A two-dimensional profile can be constructed for this purpose. One axis represents the strength of the co-creative process and the other the quality of the final product. Thus, four main configurations are distinguished:

- clear co-creative process and high-quality product;
- clear co-creative process but unsatisfactory product;
- limited or absent co-creation but high-quality product;
- limited co-creation and unsatisfactory product.

The first configuration represents the strongest practical case, but even there product quality does not replace process evidence. The second shows that co-creative interaction is no guarantee of success and that human validation may have been insufficient. The third cautions against attributing co-creation just because of an impressive result. The fourth may indicate an inappropriate task, poor organisation of the interaction, or limitations of the system used.

Product genealogy links process analysis to end result evaluation. It tracks how ideas, structures, arguments, decisions, and edits move through the different versions. It shows how they enter the final product. Without such reconstruction, process and outcome remain parallel descriptions. The relationship between them cannot be reliably explained in functional and causal terms.

Genealogical analysis covers accepted, amended and rejected proposals. Accepted proposals show a direct contribution to the final product. Amended proposals reveal how the human interprets and transforms the AI's suggestions. Rejected proposals also have analytical value. They may indicate a critical judgement, a change in criteria or a more precise definition of the goal. This applies even when their content is not present in the final result.

A reliable genealogy is built through chronologically stored dialogues, intermediate versions, and a decision log. For each key element of the product, it must be established when it originated and from whose input it originates. It is also necessary to trace its transformations and the grounds for its adoption. Not every word needs to be attributed entirely to human or AI. However, it is important that the functional history of the essential elements can be reconstructed.

When the product is a text, changes in thesis, argumentation, structure, and terminology can be analysed. In a visual product, the composition, colour schemes, symbols and sequential variations can be tracked. In a model or decision, assumptions, variables, dependencies, criteria, and rejected alternatives can be analysed. The method must be adapted to the type of artefact without losing the general logic of traceability.

Analysis of alternative explanations is a mandatory stage of identification. It examines whether the observed outcome and hypothesised process effects have a simpler explanation. They may arise from the individual's expertise, templated machine output, technical or editorial assistance, detailed advance specification of the task, or accumulated human labour. Only after rejecting these alternatives can it be more reliably assumed that the outcome is related to co-creative interaction.

It should be emphasised that the presence of machine text in a product does not prove co-authorship if the system only formulated already fully human-defined content. Also, the absence of verbatim machine content does not preclude a co-creative function if a machine question or criticism has resulted in a traceable

change of human conception. Analysis must assess functional influence, not just superficial textual provenance.

Whenever possible, the final product should be evaluated independently of information about how it was created. Prior knowledge of an AI system's involvement can affect the evaluation both positively and negatively. Separating process coding from outcome scoring limits the risk of such biases. It also allows a subsequent comparison of the evaluations for the process and the final result.

Table 6 summarises the four analytical domains and shows the different questions they answer.

Table 6. *Process criteria and product genealogy*

<i>Dimension</i>	<i>Indicators</i>	<i>Analysis question</i>
Process	Recursion; transformation; feedback; resonance; distribution of decisions.	How does the interaction develop?
Product	Originality; justification; accuracy; applicability; conceptual integrity.	What is the quality of the result?
Genealogy	Accepted, amended and rejected proposals; link between versions; origin of key elements.	How do the distinguishable contributions reach the product?
Alternative explanations	Individual human work; template machine output; editorial assistance; effect of accumulated human labour.	Can the result be explained more simply?

Considering the four areas together allows a more complete and carefully qualified conclusion to be formulated. Process analysis determines whether the interaction has a recursive and transformative nature. The product rating shows its value according to external criteria. Genealogical analysis traces the relationship between the process and the end result. The analysis of alternative explanations examines whether the designation of the interaction as co-creative is actually justified.

When the process evidence is strong but the product is of poor quality, it must be determined at which stage the problem occurred. It is possible that the interaction overextended the range of options without leading to an appropriate choice. The reason may also be insufficient human verification or lack of clear quality criteria. This does not deny the co-creative nature of the process, but it does reduce its practical value.

The opposite situation is also possible – a high-quality product with little evidence of a co-creative process. Then it is more accurate to talk about effective instrumental support. Artificial intelligence may have contributed to faster work,

variant generation or language shaping. However, this does not necessarily mean that it participated in the recursive transformation of the task. The usefulness of the system should not be underestimated, but it is not sufficient reason to define the interaction as co-creative.

Genealogy can reveal that co-creativity is not evenly distributed within the product. Some of its parts may be the result of intense interaction and transformation. Others may be entirely human-made, and still others may include machine output without substantial processing. In such cases, the product can be defined as mixed. However, it is necessary to clearly indicate the specific areas and functions of the machine contribution.

Failed and rejected proposals are also part of the product genealogy. Their function can be negative, neutral or productive. Irrelevant option sometimes slows down the work. In other cases, however, it helps to specify the criteria or clarify the direction of the search. Therefore, the analysis should not be limited to the question of whether a proposal is included in the final product. It is also important to trace its influence on subsequent decisions.

Synergy can be considered as a possible result of the co-creative process, but not as a necessary condition for its establishment. It suggests that the joint result is superior to the results that the human and AI could achieve separately. This is a strong comparative claim and requires a proper empirical basis.

The assessment of synergy involves a comparison between three conditions: independent human work, independent machine generation, and human–AI interaction. The task, time, available information and assessment criteria should be the same. The products created should be independently evaluated. The differences found should not be due to unequal resources or different work durations.

Comparisons with assumed abilities are not reliable enough. It cannot be argued that a human “would never” arrive at a particular solution or that an AI “could not” create it independently if it is not empirically verified. Such conclusions are particularly uncertain in open-ended creative tasks, since the space of possible solutions cannot be exhausted.

In the absence of a real basis for comparison, the defensible conclusion is more limited. It may be established that the product contains a traceable transformation of distinguishable human and machine inputs, does not correspond to any of the original options, and acquired its particular form through recursive interaction. This provides grounds for inferring a co-creative origin, but does not prove that the result is superior to any possible products that a human or AI could have created on their own.

Synergy should be distinguished from increased efficiency. Faster product development, lower costs, or a greater number of variants generated can be significant benefits of collaboration. However, they do not prove that the end result

is of higher quality. Therefore, efficiency, quality, novelty and co-creative origin should be evaluated as separate dimensions.

Negative synergy is also possible, where the interaction with the AI leads to a weaker result than the human participant would achieve independently. The reasons can be various: automation bias, weakening confidence in one's own judgement, information overload, accepting wrong suggestions or excessive time spent on editing. Analysis of such cases is necessary to achieve a balanced assessment of human–AI interaction.

The final conclusion must consider the process, the product, its genealogy, and alternative explanations as separate but interrelated components. It should clearly state the type of interaction established, the quality of the end result and the contributions that can be reliably traced. It is also necessary to assess the extent to which the observed configuration could be explained in a simpler way. This avoids both the uncritical admiration of the technology and the unfounded denial of the actual functional role of AI.

8. Classification conclusion and degree of manifestation

The conclusion is formulated at three levels: interaction type, manifestation profile, and degree of confidence. Four types are distinguished: instrumental use, assisted creation, resonant interaction and asymmetrical co-creation. Integrated intelligence is not a fifth type. It is a systemic interpretation, warranted only when resonance, co-creation, product genealogy and human responsibility form a coherent configuration.

The degree of manifestation is represented by a profile, not necessarily by a single overall index. For example, an episode may be characterised by strong cognitive and creative resonance, limited emotional resonance, pronounced co-creation, and a high-quality product. The conclusion is assigned low, moderate, or high confidence depending on the completeness, independence, and consistency of the evidence.

The classification follows a hierarchical logic. First, it is checked whether the necessary conditions are met. The resonance profiles and the co-creative function are then determined. Finally, product genealogy, negative evidence, and possible alternative explanations are compared. High scores on supporting indicators cannot compensate for the lack of a prerequisite.

With incomplete or conflicting data, the conclusion should be cautious. Neither positive nor negative classification should be artificially imposed. It is important to clearly distinguish between lack of manifestation, insufficient data, and borderline configuration, as each of these situations has a different methodological meaning.

The final report should briefly state the unit of analysis, the sources used, the criteria met and not met, the manifestation profile, the main alternative explanations, and the level of confidence. In this way, the classification remains verifiable and can be revised as new data emerges.

9. Reliability and validity

Reliability and validity are the main prerequisites for the proposed methodology to become a robust research tool rather than remain merely a conceptually grounded framework. Although closely related, they refer to different qualities of the methodology. Reliability indicates the extent to which a procedure produces similar results when repeated, including when used by different raters or in similar cases. Validity, in turn, refers to whether the selected concepts, indicators, and inferences actually reflect the hypothesised manifestation of integrated intelligence.

High reliability alone does not guarantee validity. Two raters can consistently apply the same coding scheme without it actually measuring resonance and co-creation. It is possible that the scheme instead considers overall productivity, dialogue duration, or participant satisfaction. The opposite situation is also possible: the criteria are theoretically appropriate but practically unreliable because they are too general, overlap or do not allow a clear distinction between positive, negative and borderline cases.

Verification must cover the entire chain from conceptual definition to final conclusion. It is necessary to establish whether the theoretical characteristics are represented in the criteria, whether the criteria are translated into observable indicators, and whether these indicators can be coded consistently. It should also be checked whether the obtained results support the expected relationships. The weakness of any link in this chain limits the validity of the final conclusion.

Assessment of reliability and validity should proceed step by step. In the beginning, expert evaluation, pilot coding and detailed analysis of individual cases play a major role. As a larger corpus accumulates, quantitative procedures can be applied to establish reliability, test hypotheses, and compare models. More complex statistical analyses are justified only when the categories are sufficiently stabilised, the sample is appropriate, and the data meet the requirements of the chosen method.

Prior to formal validation, it must be ascertained whether the terms and instructions are sufficiently clear. Evaluators must reliably distinguish between cognitive, creative, and emotional resonance, as well as co-creative function, creative stimulation, and instrumental support. If the same examples are systematically interpreted differently, the reason may lie in unclear boundaries between categories, and not necessarily in insufficient training of raters.

Content validity indicates the extent to which the system of criteria covers the essential characteristics of the studied construct. In integrated intelligence, this implies the inclusion of purposeful context, substantive contributions, recursion, the three types of resonance, asymmetrical co-creation, product genealogy, and preserved human responsibility. If a dimension is missing or represented by only one too narrow indicator, the methodology may create a distorted view of the phenomenon (Messick, 1995).

Checking for content validity requires systematic matching of the conceptual framework with the coding scheme. Each theoretical component must be associated with one or more observable indicators. At the same time, each indicator must have a clear theoretical basis. To this end, a matrix can be drawn up showing which features are covered, where there is overlap and which areas remain under-represented.

Expert evaluation should include the perspectives of specialists from different fields. Relevant expertise includes human-computer interaction, AI, cognitive science, creativity, methodology and ethics. The interdisciplinary composition is necessary because the construct combines technical, psychological, process and normative dimensions. Experts should assess the relevance, clarity and necessity of each criterion, as well as identify possible gaps in the system.

Construct validity indicates whether the observed codes and indicators actually reflect the hypothesised theoretical structure and the relationships between its components. If the conceptual framework distinguishes three types of resonance, the empirical data should allow their analytical distinction. At the same time, they should not be seen as completely independent phenomena. If recursiveness and transformation are defined as essential conditions for co-creative interaction, their stronger manifestation should be associated with a more clearly traceable genealogy of the final product (Campbell & Fiske, 1959; Messick, 1995).

Construct validity testing begins with hypotheses formulated in advance. For example, one might expect the quality of feedback to be related to cognitive resonance, and the development of ideas over more than one cycle to creative resonance. Traceable mutual transformation should distinguish co-creative interactions from one-off instrumental use. If the expected relationships are not found, it should be assessed whether the reason lies in the theoretical framework, the operationalisation approach, or the quality of the data collected.

With a sufficiently large and diverse sample, factor analysis, latent variable modelling, and comparison of competing models can be applied. These methods can be used to determine whether the indicators group according to the theoretically predicted dimensions and whether an alternative structure explains the data better. However, these methods should not be applied mechanically in the early

stages, when the categories are still exploratory and the number of observed cases is limited.

Discriminant validity indicates whether the concepts of “integrated intelligence” and “asymmetrical co-creative interaction” can be clearly distinguished from closely related but theoretically different phenomena. Each of them must have its own content, distinctive characteristics and empirical manifestations that are not reducible to those of related concepts. Distinguishing them from instrumental assistance, automation, creative stimulation, hybrid intelligence, distributed cognition, and general human–AI collaboration is particularly important. If the same criteria define every beneficial interaction as co-creative, the construct loses its analytical specificity (Campbell & Fiske, 1959).

Verification must include preselected positive, negative and borderline cases. Positive cases should contain clear evidence of the fulfilment of all necessary conditions. Negatives may involve one-off machine output, mechanical editing, or an automated operation without recursive processing. In borderline cases, distinct signs of resonance or creative stimulation are observed, but the criteria for co-creation are not fully met.

Borderline cases have a special diagnostic value. They show where definitions overlap, which indicators are insufficiently specific, and what minimum threshold is needed for a classification conclusion. A methodology that works only on obvious positive and negative examples is not sufficiently validated for analysing real interactions.

Inter-rater reliability indicates the extent to which coding is independent of the subjective judgement of the particular analyst. It is particularly important in complex process categories such as resonance, transformation and co-creative function, where the same action can have different meanings depending on the context. High agreement suggests that definitions and rules are clear enough to be applied consistently (Cohen, 1960; Krippendorff, 2018; McGraw & Wong, 1996).

Raters should initially code the material independently without agreeing on their decisions during the course of the work. Before that, general preparation with a coding manual, examples and pilot exercises is required. Preparation should not aim at a mechanical unification of opinions, but at a shared understanding of the categories and evidentiary procedures.

The choice of metric to assess agreement depends on the type of data and research design. For nominal categories, the agreement between two evaluators can be assessed by Cohen’s kappa, and for more than two raters, by the corresponding multivariate extensions of this approach. For ordinal scores, weighted κ is appropriate because it accounts for the degree of disagreement between categories. In quantitative or profile assessments, the intraclass correlation coefficient (ICC)

can be used. The percentage of agreement can be presented as an additional descriptive metric, but it is not sufficient by itself, as it does not take into account the probability that some of the matches are the result of chance.

The statistical value must be accompanied by an analysis of the types of disagreement. It is possible for the overall coefficient to be acceptable, but for raters to systematically differ in distinguishing creative resonance from creative stimulation. Such a pattern indicates a need to refine specific definitions, even when overall reliability appears satisfactory.

The disagreement protocol must be predefined. After independent coding, raters can discuss differences and reach consensus or use a third rater. The original codes should not be deleted because they are needed for reliability calculations and problem category analysis.

Traceability indicates whether each code and each conclusion can be linked to specific primary data. It is a condition for reliability, verifiability and auditability. Without traceability, claims of resonance or co-creation remain dependent on the analyst's interpretive authority.

For each adjudicated code, the episode, dialogic move, product version, citation, or observed change must be specified, as well as a brief rationale. A useful tool is to create an evidence matrix that links theoretical conditions, indicators, primary data, assigned values, negative evidence, and confidence levels.

The audit trail should also include methodological decisions: how case boundaries were determined, how data were selected, how coding rules were changed, and how disagreements were resolved. This allows an outside researcher to reconstruct the analytical path from the primary material to the final conclusion.

Reflexivity is particularly important when the author, participant and analyst are the same person. This position provides access to the intentions, experiences and logic of decisions that an outside observer would have difficulty reconstructing. At the same time, it increases the risk of confirmation bias, selective recall, exaggeration of machine input, and favourable interpretation of ambiguous cases.

The reflective journal should document the researcher's expectations, changes in their own position, reasons for selecting and rejecting proposals, and moments of uncertainty. It is important to also record decisions that do not support theoretical expectations. The diary does not eliminate subjectivity, but it does make it visible and available for critical scrutiny.

External verification may include independent coding of selected episodes, critical review of the evidence matrix, or evaluation of the product by persons unfamiliar with the author's interpretation. Particularly useful is the targeted search for negative cases—episodes in which the interaction is sustained and useful but does not meet the criteria for integrated intelligence.

Ecological validity indicates the extent to which research findings apply to real practices outside the controlled environment. Laboratory tasks allow better control over time, resources, instructions, and comparative conditions, but may simplify the motivation, organisational constraints, and duration of actual work.

Natural cases provide richer information about ongoing projects, changing goals, institutional requirements, team roles, and real-world consequences. However, they involve more uncontrolled factors and often have incomplete documentation. Therefore, laboratory and natural studies should be seen as complementary.

Comparison between controlled and real cases can show which characteristics are persistent and which depend on the environment. For example, recursive transformation can be clearly observed in both contexts, while emotional resonance, decision allocation and organisational responsibility can have different manifestations. Such differences do not invalidate the construct, but delineate the limits of its applicability.

Validation must account for technological variability. Results obtained with a specific model, interface, or version may not automatically generalise to all systems. Model, version, settings, system instructions, access to external tools, and the time of execution should be documented. Repetition with different systems allows general process mechanisms to be distinguished from the effects of a specific technology.

The validity check should also consider the influence of the application context. Depending on the nature of the task, the criteria may function differently in scientific writing, creative activities, teaching, organisational planning, or technical design. Therefore, validity should be examined in a variety of settings, involving participants with different levels of expertise, different linguistic and cultural backgrounds, and different types of end products.

Validation should be carried out as an iterative process involving successive cycles of verification, analysis and refinement of the methodological framework. The results of the initial verification may require refining the indicators, distinguishing or merging categories, adjusting the threshold values or revising individual theoretical premises. All changes should be systematically documented and the updated framework verified against an independent set of data, not just the cases that led to its revision.

Assessment of reliability and validity must be performed at several inter-related levels: the individual codes, the analytic dimensions, the classification conclusions, and the methodology as a whole. It is possible for the coding of individual indicators to be consistent and reliable, without necessarily guaranteeing unequivocal classification conclusions, if the rules for integrating the indicators are not sufficiently clearly defined. Likewise, a methodology may show high va-

lidity in a particular type of task, but limited generalisability or lower ecological validity when applied to different contexts.

The final report should present not only the positive results of the validation, but also the disagreements, failed checks and limitations. Transparent documentation of weaknesses increases the scientific value of the methodology because it shows under what conditions the conclusions are defensible and where further work is needed.

Table 7 systematises the main components of reliability and validity, the characteristic risks, and approaches to their verification.

Table 7. *Assessment of reliability and validity*

<i>Component</i>	<i>Main risk</i>	<i>Inspection approach</i>
Content validity	The criteria do not cover the essential characteristics.	Expert evaluation and comparison with the conceptual framework.
Construct validity	Codes do not reflect assumed relationships.	Hypothesis testing, factor analysis and model comparison.
Discriminant validity	Co-creation is no different from assisting or hybrid intelligence.	Positive, borderline and negative cases.
Inter-rater reliability	Coding depends on subjective judgement.	Independent raters, κ or ICC, and disagreement protocol.
Traceability	The output cannot be connected to the primary data.	Audit trail, versions and evidence matrix.
Reflexivity	The author and the analyst are the same person.	Reflective journaling, external verification and negative evidence.
Ecological validity	Controlled task does not reflect real work.	Comparison of laboratory and natural cases.

10. Prospective quantitative and comparative validation

Quantitative validation should be a subsequent, not an initial, step in methodology development. In the early phase, the main task is to clarify the content of the construct, to define its boundaries, and to establish how the hypothesised manifestations can be recognised in real interactions. Premature construction of a scale would create the risk of quantifying a still unclear or unstable concept (Boateng et al., 2018).

The development of a standardised measurement instrument requires prior refinement of the theoretical concepts of cognitive, creative and emotional resonance, asymmetrical co-creative interaction and product genealogy. A clear conceptual distinction is also needed between asymmetrical co-creative interaction,

instrumental assistance, creative stimulation, resonator function and general utility of AI systems. With substantial overlap between these categories, quantitative indicators would lose their unambiguous interpretation and theoretical validity.

Indicator development should begin with a qualitative analysis of a diverse empirical corpus. Besides typical positive examples, it should include negative, contradictory and borderline cases that test the distinctiveness of the proposed categories. This makes it possible to identify the features that consistently distinguish asymmetrical recursive co-creative interaction from one-off interaction or from the use of AI as a primarily instrumental tool.

Qualitative mapping should include a wide range of tasks and end products to assess the robustness of the proposed indicators in different application contexts. The analytical function of individual indicators may change depending on the nature of the activity, for example in conceptual writing, problem-solving, creating visual artefacts, training, organisational planning or technical design. Therefore, the methodology must clearly distinguish universal process indicators, which occur regardless of the subject area, from context-specific indicators, whose meaning depends on the characteristics of the task or product (Braun & Clarke, 2006).

The next step is substantive validation through interdisciplinary peer review. Experts must assess whether the proposed indicators are relevant, sufficiently clear, mutually distinguishable and representative of the theoretical dimensions. Specialists in AI, human-computer interaction, cognitive science, creativity, psychometrics, organisational research, and ethics are appropriate.

Expert evaluation should determine whether the proposed indicators do not introduce an implicit assumption of psychological symmetry between the human participant and the AI system. Operational definitions should describe only observable characteristics of the interaction and functional changes in the outputs generated, without attributing mental states, intentions, understanding, consciousness, or emotional experiences to the system. Maintaining this ontological caution is necessary both in qualitative analysis and in the transition to quantitative measurement.

Cognitive interviews represent an important stage in the validation of the measuring instrument, because they make it possible to examine how prospective raters and participants interpret the concepts, questions and scale categories used. Such verification is particularly necessary for concepts such as “resonance”, “transformation”, “asymmetrical co-creative interaction” and “traceable contribution”, which can be understood in different ways. Analysis of the interviews makes it possible to determine whether the responses are based on the intended theoretical content of the measured constructs or rather reflect general ratings of satisfaction, usefulness, or positive attitudes toward using the AI system.

Prior to developing self-report scales or standardised measurement instruments, pilot coding should be conducted. In it, independent raters apply the operational categories to the same corpus of interactions, without prior agreement on individual coding decisions. Subsequent analysis of disagreements should assess the clarity of operational definitions, the adequacy of coding rules, and the observability of individual indicators. Indicators that cannot be coded consistently by independent raters should be refined or excluded from the final methodological framework.

Reliability should be assessed separately for each analytical dimension and for each category in the methodological framework. High general agreement between raters may mask systematic difficulties in distinguishing between conceptually close categories, for example between creative resonance and creative stimulation or between asymmetrical co-creative interaction and sustained instrumental assistance. Therefore, along with general indicators of agreement, it is necessary to analyse the matrix of disagreements and typical borderline cases, since it is these that reveal the categories that require further refinement of operational definitions and coding rules.

Reliable process coding creates the necessary prerequisites for the development of quantitative indicators, but does not mean that all analytical dimensions must be operationalised through one common scale. The nature of individual constructs may require the use of different measurement methods—expert coding of the interaction, analysis of successive product versions, or participant self-report. Such a multi-method approach allows each dimension to be assessed through the most appropriate data source and limits the risk of reducing the complex characteristics of the interaction to the results of a single instrument, for example a self-report questionnaire.

An appropriate approach is to use a multimethod research design that combines process coding, self-reports, behavioural measures, genealogical analysis, and independent external evaluation of the final product. It should be noted that different dimensions may require different data sources. For example, emotional engagement can be assessed through a combination of self-report and behavioural metrics, while traceable transformation should be established through analysis of interaction and successive versions of the product. The consistency of the results obtained by the different methods would provide stronger evidence for the validity of the proposed methodological framework.

Validation of the proposed methodology requires the use of a comparative research design with at least three conditions: (1) independent work without the use of an AI system; (2) work with limited instrumental support; (3) work based on recursive interaction with the system. This allows one to assess whether the observed manifestations of resonance and asymmetrical co-creative interaction

arise from the recursive organisation of interaction rather than representing a general effect of using generative AI as an assistive tool (Shadish et al., 2002).

For comparisons to be interpretable, experimental conditions must be equivalent in terms of task, performance time, available information, scoring criteria, and editing capabilities. Any systematic difference between conditions (e.g., extra time, more resources, or different instructions) could become a competing explanation for the observed results. Therefore, experimental controls should minimise the influence of such factors, so that the differences found can be more confidently related to the specific mode of interaction, rather than to the peculiarities of the experimental organisation.

It is useful for the benchmark design to include a non-recursive-use condition of an AI system. Under this condition, the participant receives one or more answers generated in advance but cannot continue the interaction through sequential feedback. The juxtaposition between this condition and recursive interaction makes it possible to distinguish two potential mechanisms of impact: (1) the effect of the initial generation of variants and (2) the effect of their gradual refinement through recursive interaction. This distinction is important for testing the main hypothesis. According to it, resonance and asymmetrical co-creative interaction are determined by the recursive organisation of the interaction and not only by access to a generative model.

The appropriate research design is determined by the objectives of the study and the hypotheses being tested. A between-group, within-group, or mixed design can be used. Each has its own advantages and limitations. The between-group design limits the transfer of knowledge, strategies, and experiences between conditions. However, it requires more participants to provide comparable statistical precision. A within-group design compares different conditions within the same participants. Thus, the influence of individual differences is reduced. However, effective control over the order of conditions, transfer of experience and fatigue is required. This can be achieved by randomisation or sequence balancing.

Randomisation of participants and balancing of assignments enhance internal validity. They limit systematic differences between experimental conditions. When complete randomisation is not possible, potential confounding variables should be measured and controlled. These include prior expertise, experience with AI systems, digital literacy, motivation and attitude towards technology. These factors can affect the way of interaction and the quality of the final product. Therefore, they should be included in the analytical model as control variables. Alternatively, they may be accounted for by appropriate group matching procedures.

Quantitative validation must preserve the distinction between the process characteristics of the interaction and the outcome characteristics of the final product. Therefore, the dependent variables can cover different dimensions, such as:

resonance profiles, degree of fulfilment of the criteria for asymmetrical co-creative interaction, quality of the final product, execution time, number of successive versions, confidence of the participant and quality of independent human verification. Each of these variables reflects a different aspect of the studied phenomenon and should be analysed independently or as part of a measurement model specified in advance. Combining them into one common indicator is justified only if it is supported by clear theoretical arguments and empirical evidence of their structural relationships.

Evaluation of the final product should be independent of process coding at both organisational and analytical levels. Whenever possible, evaluators should be “blind” to the experimental condition under which the product was created to prevent the influence of prior expectations or attitudes towards the use of AI systems. Such a procedure reduces the risk of systematic evaluative bias and allows for a more reliable examination of the relationships between interaction characteristics and final product quality.

After specifying the operational indicators, the empirical verification of the measurement model begins. The first step can be an exploratory factor analysis (EFA). Through it, it is⁸ established whether the indicators are grouped in accordance with the assumed theoretical dimensions. This approach is particularly appropriate when developing new measurement instruments whose factor structure is not yet sufficiently empirically grounded (Boateng et al., 2018; Kline, 2023).

Based on the established factor structure, confirmatory factor analysis (CFA) can be applied to test a prespecified measurement model. Through it, competing models can be compared. These are the correlated three-factor model of resonance, the single-factor model, and the hierarchical model. In the latter, individual factors are united by a higher-order factor that represents the general process construct. Evaluation should consider fit with empirical data, theoretical validity, interpretability, and model parsimony (Kline, 2023).

Exploratory and confirmatory factor analysis are applied to independent samples or to previously divided parts of a sufficiently large empirical corpus. Typically, the factor structure is first explored by exploratory factor analysis and then verified by confirmatory analysis on independent data. This procedure limits the risk of overfitting, whereby the measurement model reflects idiosyncrasies of a particular sample rather than the stable structure of the construct under study.

Reliability of the measurement model is assessed by means of indicators tailored to the structure and type of data. Presenting only one internal consistency

⁸ EFA is a statistical method for investigating the latent structure of a set of observed variables or indicators. It indicates whether these indicators can be grouped into a smaller number of latent factors. The method is applied when the number of factors and the indicators belonging to each factor have not been established in advance.

coefficient is not sufficient. It is necessary to establish whether the indicators are sufficiently connected without unnecessarily overlapping. It is also important to check whether the relevant dimension is measured consistently across different groups and contexts.

Convergent validity implies a sufficiently strong relationship between indicators of the same construct. The reason is that they measure a common theoretical dimension. For example, indicators of cognitive resonance should reflect changes in understanding, conceptual organisation, and cognitive restructuring. However, this connectivity should not be primarily due to external factors. These are the duration of the interaction, the number of messages exchanged and the overall satisfaction of the participant. Otherwise, the indicators may be measuring a different construct than originally intended.

Discriminant validity indicates whether individual constructs can be empirically distinguished from each other and from related but theoretically distinct phenomena. For example, creative resonance should be distinguishable from the originality of the final product, and emotional resonance from general trust or positive attitudes toward technology. Likewise, asymmetrical co-creative interaction should be distinguishable from both instrumental assistance and general efficiency in the use of AI systems.

An important stage of validation is the verification of measurement⁹ invariance across different participant groups and application conditions. Without evidence of invariance, it cannot be assumed that observed differences reflect genuine differences in the constructs rather than differences in how the measurement instrument functions. Therefore, when the data and measurement model specification permit, configural, metric, and scalar invariance should be examined sequentially. Only when a sufficient degree of invariance is present can valid comparisons be made between participants of different expertise, between different language versions, or between interactions with different AI models (Kline, 2023).

After establishing an acceptable measurement model, one can proceed to Structural Equation Modelling (SEM). This approach makes it possible to examine simultaneously the relationships between the latent constructs and the observed indicators, as well as the direct and indirect relationships between the characteristics of the interaction and the quality of the final product. SEM can be used to investigate whether recursive interaction with an AI system affects cognitive resonance; whether cognitive and creative resonance mediate the re-

⁹ Measurement invariance indicates whether a measurement instrument retains the same structure and meaning of the constructs being measured across different groups of participants, conditions of application or measurement contexts. Measurement invariance is a prerequisite for valid comparisons of results between these groups.

relationship between the recursive organisation of interaction and the conceptual quality of the final product; and whether resonance, in turn, predicts final-product quality. It can also be used to analyse indirect effects in which resonance acts as a mediator (Kline, 2023).

Structural modelling alone does not prove causal relationships. Such an interpretation requires a theoretical rationale and a clearly established temporal sequence between the variables. It is also important to control for possible alternative explanations. Whenever possible, an experimental or other design that allows for causal inferences should be used. In self-report cross-sectional studies, relationships between variables should be viewed as associative rather than causal.

Longitudinal research designs are particularly suited to the study of integrated intelligence because it develops over time. They can be used to track how participants improve their skills as they gain experience. These skills include task formulation, critical evaluation of machine-generated proposals and co-creative interaction. These designs also make it possible to determine whether different resonance forms are enhanced or weakened. They can also reveal gradually occurring adverse effects. These include automation bias, over-reliance on AI and a diminished capacity to perform tasks independently (Shadish et al., 2002).

It is also appropriate to track changes in the functional role of AI over time. In the beginning, the system can be used primarily as a tool, and with the accumulation of experience it can acquire a resonator or co-creator function. The opposite dynamic is also possible, where initially intensive and productive interaction gradually turns into routine and patterned.

Multisite studies are needed to assess external validity. They allow the methodology to be tested in different institutions, professional fields, cultural environments and technological settings. Harmonised protocols facilitate comparison between different contexts, but should retain sufficient flexibility to analyse significant differences between them.

Different models, versions and interfaces also need to be investigated. Technological characteristics can influence the length of accessible context, response consistency, multimodal capabilities, and adaptation to feedback. Therefore, a result found when working with a particular system cannot automatically be generalised to all generative models.

External validity requires diversity in terms of tasks as well. Structured tasks with a verifiable response allow for more reliable assessment of accuracy, while open-ended tasks are better suited to exploring creative resonance and the transformation of the solution space. Combining the two types of tasks allows us to identify which mechanisms are common and which depend on the specifics of the task.

A quantitative research programme should include advance sampling planning and statistical power analysis. The required sample size depends on the number of indicators, the complexity of the model, the expected size of the effects, the nested structure of the data, and the number of groups being compared. Therefore, a universal minimum number of observations should not be determined without specific research design and prior analysis.

For data with a hierarchical structure (e.g. dialogic moves nested in loops, loops in episodes, and episodes in actors), appropriate statistical models designed for the analysis of hierarchically organised data (multilevel models) should be used. Treating all dialogic moves as independent observations would lead to underestimation of uncertainty and unwarranted overestimation of statistical significance.

Missing data, broken dialogues, and incomplete versions should be analysed systematically. Missing data may not be random, as participants may terminate an interaction precisely when they perceive it as unsuccessful or unsatisfactory. Excluding such cases could lead to an overestimation of the effectiveness and sustainability of the co-creative process.

Pre-registration of the hypotheses, key indicators and analytical decisions would increase the transparency of the study. Confirmatory analyses should be clearly distinguished from exploratory analyses. Changes made after data review should be explicitly identified and verified in a subsequent independent study.

Open sharing of coding manuals, anonymised examples, analysis scripts, and measurement models would aid reproducibility. However, full dialogues may contain personal data, protected content or other sensitive information. Therefore, transparency must be combined with informed consent, reliable anonymisation and appropriate access control.

Quantitative validation should not erase the complexity of the construct by prematurely reducing it to a single common index. The profile of individual resonance types and co-creation criteria may be more informative than a single summary value. If a common index is to be proposed, its structure, weights, and thresholds should be theoretically grounded and independently validated.

Methodology development should proceed iteratively. The results of qualitative research inform the development of the indicators, and pilot coding reveals ambiguities and problems in the definitions. Measurement analyses test the hypothesised structure, while comparative and longitudinal studies assess the robustness of established relationships and their generalisability. Where inconsistencies arise with empirical data, the theoretical framework and research tools should be refined and, if necessary, partially rejected.

This consistency limits the risk of statistical complexity becoming a substitute for conceptual clarity. Confirmatory factor analysis and structural equation

modelling are appropriate only when categories are sufficiently stabilised, indicators are content-validated, coding is reliable, and a sufficient volume of qualitative data has been accumulated.

Table 8 presents a step-by-step programme for moving from the qualitative mapping of the phenomenon to comparative, measurement, structural and external verification.

Table 8. *Future empirical validation programme*

<i>Stage</i>	<i>Target</i>	<i>Approach</i>
Qualitative mapping	Development and refinement of indicators.	Contrasting cases, thematic and process analysis.
Expert assessment	Content validity and clarity.	Interdisciplinary panel and cognitive interviews.
Pilot coding	Applicability and reliability of codes.	Independent raters and analysis of disagreement.
Comparative design	Distinguish between instrumental, assisted and co-creative work.	Conditions involving no AI, one-off assistance, and recursive dialogue.
Measurement model	Structure of the latent dimensions.	EFA/CFA, reliability, convergent and discriminant validity.
Structural check	Relationships between dialogue, resonance, co-creation and outcome.	SEM or other appropriate causal models.
External validity	Generalisation across actors, models, tasks and contexts.	Multisite and longitudinal studies.

11. Methodological conclusion

The proposed methodology turns the theory of integrated intelligence into a testable procedure for analysing specific human–AI interactions. It brings the ontological definition of the phenomenon, the logical conditions for its recognition, operational indicators, profile measurement and empirical validation together in a common architecture that is subject to recursive improvement.

The basic unit of analysis is the co-creative episode, explored through dialogic moves, recursive loops, and the genealogy of the end product. The methodological core is traceable transformation: how human and machine-generated inputs alter subsequent actions, how cognitive, creative, and emotional resonance manifest themselves, and how these processes contribute to shaping the outcome.

Asymmetrical co-creation can only be accepted when the AI contribution is distinguishable, is involved in an iterative transformation, affects the space of possible solutions, and has a traceable and proven role in the final product. Partial fulfilment of these conditions requires a more cautious classification, for example as instrumental assistance, creative stimulation, a resonator function or a mixed function.

Process and product must be evaluated separately. A high-quality result alone does not prove co-creation, nor does a co-creative process guarantee high quality. Product genealogy and analysis of alternative explanations bridge the two levels and limit the attribution of effects that can be more convincingly explained by human expertise, patterned machine output, or simple editorial assistance.

The classification conclusion should integrate the interaction type, manifestation profile, and degree of confidence, considering positive, negative, borderline, and conflicting evidence. Reliability, validity, traceability and reflexivity are conditions for the admissibility of an inference. Quantitative modelling is justified only after conceptual stabilisation and pilot validation of the categories.

The methodology preserves the ontological and normative asymmetry between the participants. It allows for a genuine functional contribution by AI without ascribing to it human-like consciousness, authorship, or moral responsibility. The human participant sets or affirms the goals, verifies the result, and is responsible for its use.

Therefore, integrated intelligence is a putative systemic phenomenon that needs to be justified on a case-by-case basis and not a presupposed quality of any useful human–AI interaction. The methodological value of the proposed conceptual framework lies precisely in the possibility of confirming, limiting or rejecting this claim based on transparent, traceable and reproducible evidence.

LITERATURE REVIEW ON INTEGRATED INTELLIGENCE

This literature review traces the development of the concept of “integrated intelligence” and identifies the research gap that the proposed framework seeks to address. Integrated intelligence is not presented as an established theory, nor is it derived directly from existing concepts. The analysis examines how different academic disciplines explain human–AI complementarity, shared cognitive processes and human control. It also considers assistance from generative AI, resonance and co-creation, before identifying the questions that remain unresolved.

The guiding question is: what does the literature on human–AI interaction already explain, and what does it not yet explain, about the transition from technological assistance to cognitive, creative and emotional resonance, asymmetrical co-creation and co-created outputs? The review uses critical synthesis to distinguish the contribution, analytical scope and significance of each strand of research for the theory proposed here.

Accordingly, the review critically analyses several fields of scholarship, identifying what each explains, the limits of its explanatory reach and its contribution to the theory proposed here.

The literature provides a basis for the individual components. Their connection in the sequence “resonance → co-creation → co-created product → possible manifestation of integrated intelligence” constitutes an authorial contribution. The treatment of cognitive, creative and emotional resonance as related but distinct processes is likewise original to the proposed framework.

The review is conceptual and critical rather than systematic. The selected sources represent the principal theoretical strands required to clarify the construct, but do not encompass all of the available literature. Fields that contribute to understanding at least one of four issues are included: the distribution of functions, mutual transformation, the role of AI as a co-creator or resonator, and the creation and validation of a shared product. This clarification is important: the research gap is defined by comparing the explanatory limits of existing approaches, rather than by claiming that research on human–AI interaction is wholly lacking (Snyder, 2019).

1. Human–computer symbiosis and intelligence augmentation

Licklider (1960) formulated a vision of human–computer symbiosis based on the distinct but complementary capabilities of humans and computers. In this vision, the human defines the goals, formulates hypotheses and evaluates the results, while the computer performs routine computational and information-processing operations. Together, they can solve problems, make decisions and manage complex situations. The historical significance of this formulation lies in its shift away from a choice between human or machine and towards the coordination of their different capabilities within a shared process. Engelbart (1962) developed a related but explicitly human-augmenting perspective. In his account, technical tools, together with language and working methods, can enhance a person’s ability to understand complex situations, structure concepts and information, identify solutions and implement them.

These approaches place the complementarity of functions and co-operation between humans and technology at the centre of analysis. However, they remain at the level of general ideas. They do not explain clearly enough when the contribution of the technology becomes co-creative. Nor do they show how that input develops through iterative dialogue and can be traced in the final product. These approaches therefore provide an important historical foundation, but do not offer a comprehensive theory of integrated intelligence.

The transition from early human–computer interaction to contemporary work with generative AI changes both the technical capabilities involved and the appropriate mode of analysis. In early systems, computers primarily assisted with computation and information processing (Licklider, 1960; Engelbart, 1962). Contemporary generative models can produce content and propose alternatives that a person evaluates and revises (Bommasani et al., 2021). The interaction can therefore proceed through several successive cycles. Within the framework proposed here, this requires analysis of how human and AI inputs change over the course of the work and how they contribute to the final outcome.

2. Distributed, augmented and collaborative knowledge

The theory of distributed cognition shifts attention from individual thought to the cognitive activity of an entire system comprising people, technical artefacts, information and the environment. Hutchins (1995) and Hollan, Hutchins and Kirsh (2000) show that cognitive processes can be distributed across people, the tools they use and their environment. Overall performance depends on the connections and coordination among these components. This perspective can also be applied to human–AI interaction, with the human and the AI treated as

components of a common system. This application, however, concerns the distribution and coordination of functions; it does not imply that humans and AI have equal status. In the framework proposed here, AI is not assumed to be a thinking or morally responsible agent in the human sense.

Clark and Chalmers (1998) propose that external resources may form part of a cognitive process. Their examples include notebooks, pocket calculators, computers, and pen and paper. Their central example is Otto's notebook, which performs a memory-like function. In their account, an external resource can become part of the cognitive process when it is readily accessible and habitually used, and when the information it contains directly guides the person's actions. A contemporary example would be information stored on a mobile phone and routinely consulted rather than memorised. Hollnagel and Woods (2005) propose that a person and the technology they use should be regarded as components of a joint cognitive system. Within such a system, they perform interrelated functions and jointly support task performance. The outcome depends not only on human and technological capabilities considered separately, but also on their coordination. When working with AI, for example, the system may process information and propose alternatives, while the person evaluates them and makes a decision. This is an application of the authors' argument to contemporary AI rather than an example taken directly from their work. More broadly, this theory supports the view that cognitive activity can be studied at the level of the system as a whole, rather than solely at the level of the individual.

The limitation of these approaches is that the distribution of functions does not necessarily entail their integration within a single process. Not every system comprising humans, data and technical resources exhibits integrated intelligence. It is therefore necessary to explain how different contributions transform one another across a series of cycles, influence subsequent actions and lead to a co-created outcome.

3. Collective intelligence and organisational knowledge

Research on collective intelligence shows that a group's ability to perform various tasks is not explained solely by the abilities of its individual members. Lévy (1997) defines collective intelligence as based on knowledge that is distributed among people, continuously developed and coordinated through their interaction. Wegner's (1987) theory of transactive memory complements this perspective by explaining how a shared understanding of the distribution of expertise enables a group to draw on knowledge that no individual member fully possesses. Hutchins (1995) extends the analysis through the notion of distributed cognition, where cognitive processes span the people, the tools used, and the

representations created. Hong and Page (2004) in turn show the importance of diversity of perspectives and approaches in collective problem-solving. Malone, Laubacher, and Dellarocas (2010) draw attention to the organisational mechanisms of collective intelligence, and Woolley et al. (2010) provide empirical evidence for a general factor of collective intelligence.

Organisational theories extend analysis to the processes by which knowledge is created, integrated, and used. Grant (1996) views the organisation as a mechanism for integrating the specialised knowledge of its members. Nonaka and Takeuchi (1995) explain the creation of organisational knowledge through transformations between tacit and explicit knowledge, and Choo (1998) links the creation of meaning, knowledge and decisions. Crossan, Lane and White (1999) show how learning moves between the individual, group and organisational levels, while March (1991) poses the problem of the balance between exploring new opportunities and using already acquired knowledge. Alavi and Leidner (2001) complement this perspective by analysing how information systems support the creation, storage, transfer and application of organisational knowledge.

In contemporary organisations, AI systems can support the processing and structuring of information, the identification of relationships and access to organisational knowledge. At the same time, however, they can transform established practices, the distribution of expertise and the criteria by which knowledge is regarded as valid (Faraj et al., 2018; Jarrahi, 2018).

The authors cited above explain how outcomes can arise at group or organisational level that are not attributable to the capabilities of any single participant. Because this body of theory was developed primarily in relation to human collectives, its application to human–AI systems requires a clear distinction between human agency and responsibility and the machine’s functional contribution.

For the purposes of the present conceptual framework, it is useful to distinguish three ways of combining human and AI-generated ideas, analyses, evaluations and decisions. Aggregation brings together outputs produced separately by humans and AI. Coordination allocates tasks between them and establishes the sequence of actions. Integration entails the joint interpretation and mutual transformation of human and machine inputs into a coherent outcome. This distinction is introduced within the present framework and is not a direct model proposed by the authors discussed above.

The organisational literature is particularly important for understanding integration. It shows that the output created does not automatically become organisational knowledge. It needs to be interpreted, verified, shared and incorporated into the organisation’s decisions, practices and established procedures. Therefore, AI can make a significant contribution to the generation and transformation

of content, but people and organisations remain responsible for its evaluation, adoption and use.

4. Augmented and hybrid intelligence

Augmented intelligence treats AI as a means of enhancing human capabilities. Its conceptual antecedents include Licklider's (1960) account of human–computer symbiosis and Engelbart's (1962) framework for augmenting human intelligence through an integrated system of people, methods and technical resources. In the present framework, augmented intelligence preserves the asymmetry of roles: the human defines the goals, interprets the context and bears responsibility, while the system provides functional support.

Hybrid intelligence is the closest functional analogue to the construct under consideration. Kamar (2016) relates it to the design of systems that combine human and machine capabilities in task performance. Dellermann et al. (2019) emphasise the complementarity of these capabilities within a common system, while Akata et al. (2020) define hybrid intelligence as a combination that augments human capabilities and enables goals to be achieved that neither humans nor machines could achieve alone. They identify four principal research challenges: cooperative, adaptive, responsible and explainable hybrid intelligence.

These approaches explain complementarity, distribution of functions, and coordination in joint performance. They recognise that interaction can produce outcomes not available to participants individually, but do not systematically explore the conditions under which machine input transforms the space of possible solutions, gives rise to recursive resonant dynamics, and acquires a functional co-creative status. In this sense, hybrid intelligence is an immediate theoretical basis, but does not exhaust the concept of integrated intelligence.

5. Human-centric artificial intelligence and responsibility asymmetry

Human-centred AI establishes requirements for reliability, safety, transparency, controllability and effective human oversight. Shneiderman (2022) advocates systems that combine high levels of automation with high levels of human control. Parasuraman, Sheridan and Wickens (2000) show that human involvement should be considered in relation to different functions and levels of automation, while Amershi et al. (2019) formulate practical guidelines for intelligible, correctable and adaptive human–AI interaction. Santoni de Sio and van den Hoven (2018) link meaningful human control to a system's responsiveness to relevant human reasons and to the traceability of its actions to informed and responsible human agents.

In the present framework, this tradition defines the normative boundary of co-creation. Acknowledging an AI's significant functional contribution does not grant it academic authorship, moral responsibility, or the right to final judgement. However, human-centricity does not exclude the co-creative function of the system. It defines the asymmetry of the interaction: the human formulates the intention, exercises the final judgement and bears the responsibility, while the AI can create distinguishable contributions that transform the development or content of the result.

Meaningful human control is not reduced to the formal possibility of machine output being confirmed or rejected. In the proposed framework, it requires the person to understand the purpose, capabilities and limitations of the system; to have sufficient information to verify the result and the sources used; to have a genuine opportunity to correct or terminate the process; and to be able to take reasoned responsibility for the consequences. In co-creation, human verification, interpretation and final judgement are therefore substantive phases of creation, not administrative approval of an already completed automated process. Thus, the human-centric tradition provides both an ethical boundary for co-creation and a criterion for the quality of human–AI interaction.

6. Symbiotic interaction and functional mutualism

Contemporary uses of the concept of symbiosis point to long-term relationships in which working practices change through experience. Mackay (1990) describes the relationship between users and customisable software as a co-adaptive process, while Hoc (2000) relates human–machine co-operation to function allocation, mutual modelling and coordination. Jarrahi (2018) examines human–AI symbiosis in organisational decision-making, while Akata et al. (2020) identify adaptability as one of the principal research challenges of hybrid intelligence. In human–robot tasks, Nikolaidis et al. (2017) use “mutual adaptation” in a stronger technical sense, in which the system updates a model of human strategy. This meaning, however, cannot be transferred automatically to language models, which adapt their outputs to the available context without necessarily undergoing lasting changes to their parameters (Brown et al., 2020).

The terms “mutual adaptation”, “joint learning” and “co-evolution” should therefore be used with caution. A person may undergo lasting changes in understanding, expectations and behaviour, whereas a language model generally modifies its immediate output in response to the context provided. Bansal et al. (2019) show that human expectations of an AI system can develop over time and be disrupted by subsequent changes to the system. For an individual co-creative episode, the most defensible concept is therefore asymmetrical functional

reciprocity: the contribution of each component changes the conditions for the other's next action, but the resulting changes differ in nature and duration.

At the project and organisational level, more enduring processes of mutual shaping may occur. Orlikowski (2000) shows how the repetitive use of technology is involved in the reproduction and modification of organisational practices, and Leonardi (2011) analyses the gradual overlap of human and material agency. These approaches allow one to talk about the co-evolution of practices, organisational structures and evolving technical systems. However, such long-term co-evolution is not a necessary condition for each individual co-creative episode. Symbioticity is a possible developmental context, not synonymous with integrated intelligence.

7. Human creativity and computational generativity

Creativity research has traditionally associated creativity with originality and relevance of output (Runco & Jaeger, 2012). Amabile (1996) complements the product criteria by relating creative performance to knowledge, creative skills, motivation and social environment. From a systemic perspective, Csikszentmihalyi (1999) shows that novelty acquires creative status through the interaction between the creator, the relevant cultural field and the community that evaluates the result. Therefore, originality is a necessary but not always sufficient basis for attributing creativity.

Computational creativity raises the question of the criteria under which the behaviour of technical systems can be described as creative (Boden, 2004; Colton, 2008). Wiggins (2006) formalises creative systems through possibility spaces, rules for their exploration and evaluation mechanisms, and Ritchie (2007) offers empirical criteria for evaluating the products created by programmes. These approaches allow machine behaviour to be analysed without presuming that the system possesses human intent or understanding.

Generative models complicate this distinction because they produce texts, images and combinations that may be novel at the level of a particular output. Generative novelty, however, is not equivalent to either human creativity or autonomous creative agency. The human forms an intention, interprets meaning and context, assesses relevance and bears responsibility, while the system operates on the specified conditions and expands the space of possible alternatives through statistical and computational processes.

This distinction does not invalidate the machine contribution, but allows it to be defined more precisely as a co-creative function. Davis et al. (2013) consider human–computer co-creativity as a collaborative process, and Kantosalo and Toivonen (2016) show that forms of collaboration can be distinguished according

to the initiative and distribution of contributions. Thus, co-creation can be functionally real without necessarily entailing equal authorship, identical creative agency, or equal responsibility.

8. Creative stimulation and creative resonance

The literature on collaborative and computational creativity shows that AI can stimulate human creativity by generating options, combining ideas, and offering alternative perspectives (Lubart, 2005; Shneiderman, 2007; Davis et al., 2015). This impact can be a one-off effect and remain at the level of creative stimulation. In co-creative systems, however, the interaction can acquire an iterative character, where human and machine suggestions alternate and mutually influence each other (Yannakakis et al., 2014; Kantosalo & Toivonen, 2016). The study by Davis et al. (2015) shows specifically how human actions and evaluations can be used to modify the subsequent creative actions of the system.

Creative resonance denotes stronger relational dynamics. It occurs when human interpretation does not simply select a machine suggestion, but transforms it and returns it to the dialogue as a new goal, question, criterion, or constraint. The transformed input thus modifies the AI's subsequent generation, which in turn provides new material for human interpretation. A similar procedural logic is found in the concepts of distributed creativity (Sawyer & DeZutter, 2009), reflexive conversation with the situation (Schön, 1983), and participatory meaning making (Fuchs & De Jaegher, 2009). Resonance therefore does not mean only mutual amplification, but a recursive and mutually conditioned transformation of creative contributions.

The specific positioning of creative resonance as a mechanism between creative stimulation and co-creation (creative stimulation → creative resonance → co-creation) represents the author's theoretical synthesis. The extant literature substantiates its components, namely feedback, shifts in initiative, proposal transformation, and interaction outcome emergence, but does not necessarily organise them in the proposed sequence.

9. Cognitive resonance and the transformation of understanding

Cognitive resonance can be theoretically related to distributed cognition (Hutchins, 1995; Hollan et al., 2000), extended mind (Clark & Chalmers, 1998), distributed intelligence (Pea, 1993), co-construction of meaning (Mercer, 2000; Stahl, 2006), and reflective practice (Schön, 1983). What these approaches have in common is the understanding that thinking does not necessarily take place only within the inner space of the individual, but can develop through interaction

with other actors, symbolic structures, and material or digital artefacts. External representations can stabilise ideas, make hidden assumptions visible, and reveal relationships that were previously overlooked.

In human–AI dialogue, cognitive resonance occurs when machine-generated input not only provides information, but participates in reframing the problem: generating a new distinction, questioning an assumption, or helping to restructure the conceptual model. The subsequent human response changes the context, goals or criteria, and through them the next output of the system. The term denotes this recursive functional dynamic. It does not suggest that humans and AIs possess the same cognitive processes, understanding, or epistemic agency.

Cognitive resonance must be distinguished from both the acquisition of additional information and linguistic reformulation. Salomon et al. (1991) distinguish between the effects of working with a tool and more enduring changes in the person, while the literature on conceptual change associates learning with the reorganisation of existing concepts (Posner et al., 1982). Similarly, the distinction between single-loop and double-loop learning indicates that deeper change occurs when governing assumptions and criteria are revised, rather than merely the specific action (Argyris & Schön, 1978).

A stronger criterion for cognitive resonance is therefore a traceable change in conceptual organisation: a new relationship between concepts, a revised assumption, a reformulated problem or an altered decision criterion. The empirical basis lies in the interactional sequence “machine input → human conceptual change → subsequent machine output”, in which the final element is conditioned by the changed context. Cognitive resonance is thus established through process evidence, rather than solely through a subjective perception of usefulness.

The concept of “cognitive resonance”, its recursive structure and the process criteria for its establishment represent an authorial conceptualisation built through a theoretical synthesis of the approaches to distributed cognition, dialogical learning, conceptual change and reflective practice.

10. Emotional resonance and communicative adaptation

Affective computing studies the technical recognition, modelling, and reflection of emotional signals (Picard, 1997; Calvo & D’Mello, 2010). Studies of human responses to communication technologies show that people can apply social and emotional expectations to systems that use language and adaptive behaviour, including when they are aware of their technological nature (Nass & Moon, 2000; Nass & Brave, 2005). Emotional design further demonstrates the impact of experience on engagement and use (Norman, 2004), and research on relational and empathically responsive agents links system socio-emotional be-

haviour to perceived support, trust, and interaction sustainability (Brave et al., 2005; Bickmore & Picard, 2005).

These strands of research allow emotional resonance to be defined asymmetrically. The person experiences understanding, trust, closeness, motivation or inspiration. AI participates functionally by recognising or inferring emotionally meaningful signals and adapting the tone, structure and content of its response. That response may, in turn, affect the human experience and the person's readiness to engage in deeper dialogue. This functional interdependence does not imply symmetry between human experience and machine processing.

Emotional resonance does not demonstrate the presence of machine feelings, consciousness or subjective experience. It is a property of the communicative dynamic and of the human experience within it. Under certain conditions, affective dynamics can support engagement, resilience in the face of frustration and cognitive openness (D'Mello & Graesser, 2012), but this influence must be established empirically rather than assumed to follow automatically from a supportive tone.

Emotional resonance has a dual role. Supportive communication can increase motivation and willingness to explore alternatives, but the same characteristics can increase the anthropomorphisation and attribution of human qualities to the system (Epley et al., 2007). They can also give rise to over- or under-calibrated trust, where the persuasiveness of the interaction supersedes the assessment of the system's competence and trustworthiness (Parasuraman & Riley, 1997; Lee & See, 2004). Therefore, emotional engagement is not stand-alone evidence of integrated intelligence. Its importance should be assessed through its relationship to critical scrutiny, cognitive transformation, and the quality of decisions made.

Defining emotional resonance as an asymmetrical and recursive communicative dynamic that can both facilitate interaction and engender risks of anthropomorphisation and overconfidence is the authorial conceptualisation built through a synthesis of research on affective computing, emotional design, and human interaction with technology.

11. Human–AI co-creation

Research on human–AI co-creation and collaboration increasingly views technical systems not only as tools, but as functional actors whose suggestions can change the process and outcome of creation (Lubart, 2005; Davis et al., 2015; Kantosalo & Toivonen, 2016). Blended initiative approaches show that contributions can be developed through sequential human and machine moves where suggestions are evaluated, transformed and fed back into the creative process (Yannakakis et al., 2014; Karimi et al., 2018). Seeber et al. (2020) extend this perspective by exploring whether machines can function as teammates. Howev-

er, the terms “partner”, “participant”, and “teammate” should be used functionally and not taken as evidence of human-like subjectivity, consciousness, or moral agency.

In the present model, co-creation is defined by a distinguishable and traceable contribution, participation in the iterative transformation of proposals, influence on the space of possible solutions and an explanatory role in the genealogy of the final product. This definition does not require AI to possess consciousness, creative or scientific intent of its own, or the capacity to bear moral responsibility.

Asymmetry does not negate co-creation, but defines its specifically human-machine form. The human remains the bearer of intention, meaningful interpretation, critical evaluation and responsibility, while AI contributes through its generative and transformative capacities. Functional co-creation is therefore not equivalent to academic co-authorship and does not confer normative authorship status on the system.

Defining human-AI co-creation through traceable contribution, iterative transformation, and influence on the decision space, while simultaneously preserving asymmetry in intention, subjectivity, and responsibility, is the authorial conceptualisation built through a synthesis of research on co-creative systems, mixed initiative, and machines as participants in collaborative processes.

12. Emergence and co-created product

Emergence theories analyse properties, structures, and forms of organisation that emerge from interactions among components and are not adequately explained by considering them in isolation or simply aggregating them (Goldstein, 1999; Holland, 1992, 1998; Wimsatt, 1997; Sawyer, 2005). Process concepts of emergence emphasise the dynamics by which interactions give rise to new macroscopic patterns and levels of organisation (Crutchfield, 1994; Bedau, 1997; Corning, 2002; De Haan, 2006). Applied to human-AI interaction, this perspective allows for the investigation of whether the particular form of knowledge, solution, or creative product emerges in the recursive dynamics of the process.

To have explanatory value, emergence must be related to observable transitions between versions, rather than merely to a retrospective impression of novelty. It is necessary to trace which elements were introduced by humans and by AI, how they were accepted, transformed, combined or rejected, and how these changes shaped subsequent moves. Such a genealogical reconstruction does not prove that the outcome would have been fundamentally unattainable by either participant independently. It supports the more limited and empirically testable claim that the outcome’s particular form arose through the observed interaction.

Determining emergence in human–AI interaction through traceable transitions between versions, the recursive transformation of contributions, and the genealogical reconstruction of the final product is the author’s own conceptualisation, developed by operationalising theories of emergent properties and complex systems.

13. Critical synthesis and theoretical gap

The theoretical traditions examined illuminate distinct but complementary aspects of the field under investigation. Human–machine symbiosis and intelligence augmentation establish the co-operative orientation of the interaction. Distributed and augmented cognition justify the incorporation of technical resources into broader cognitive systems. Theories of collective and organisational intelligence elucidate mechanisms of coordination, while hybrid intelligence describes the functional combination of human and machine capabilities. Human-centred AI establishes the normative asymmetry between the human and the system, while research on creativity, affective interaction and emergence explains distinct mechanisms and possible outcomes of their interaction.

Despite these substantial theoretical resources, the existing literature does not provide a sufficiently well-developed framework explaining how cognitive, creative and emotional resonance are connected within a process of asymmetrical co-creation; how human and machine-generated inputs are mutually transformed through recursive iterations; and how each leaves a distinct and traceable contribution to the genealogy of the co-created product. The distinction between AI’s functional co-creative role and authorship, as well as moral and epistemic responsibility for the final outcome, also remains insufficiently clear.

The identified theoretical gap has three interrelated dimensions. The conceptual dimension lies in the absence of a unified account linking the three forms of resonance, asymmetrical co-creation and emergent systemic manifestation. The methodological dimension arises from the absence of sufficiently clear and applicable criteria for distinguishing technical assistance, the stimulation of human activity, resonant interaction and a co-creative function. The epistemic-normative dimension concerns the need to recognise, attribute and trace machine input without ascribing academic authorship, epistemic authority to validate the outcome, or moral responsibility to the system.

Therefore, the need for a new construct is justified only if it simultaneously fulfils three functions: integrates the different levels of interaction, offers operational criteria for their empirical distinction, and preserves the normative asymmetry between the human and machine participant. It is at the intersection of

these three requirements that the theoretical necessity of the construct “integrated intelligence” is located.

14. Positioning integrated intelligence

Integrated intelligence is positioned not as a synonym for augmented, hybrid, symbiotic, collective, or organisational intelligence, but as an authorial metaconstruct with its own explanatory focus. It designates a possible systemic level of intellectual organisation in which distinct human and machine-generated contributions are linked through resonance, recursive transformation, and asymmetrical co-creation.

This positioning avoids two opposing extremes. The first is to present AI as an independently thinking entity that understands, possesses intentions of its own and bears responsibility. The second is to regard it merely as a passive tool, without acknowledging that its suggestions can redirect the interaction, expand the space of possible solutions and influence the final outcome. Integrated intelligence occupies an intermediate position: AI is not an independent bearer of understanding or responsibility, but under certain conditions it can stimulate thought and creativity and contribute substantially to the creation of the final product. Its role nevertheless remains distinct from that of the person who sets the goals, evaluates and approves the outcome, and bears responsibility for it.

The construct can be distinguished at four levels of analysis. At the ontological level, integrated intelligence denotes a possible systemic manifestation arising in organised interaction between a human and AI. At the epistemological level, it concerns the conditions under which knowledge emerges, is transformed and is justified in the course of interaction. At the conceptual level, it is an author-defined metaconstruct linking resonance, recursiveness, co-creation and emergence within a common explanatory framework. At the methodological level, it is operationalised by identifying forms of resonance, applying criteria for a co-creative function, reconstructing the genealogy of the product, and tracing human validation and responsibility.

This positioning has important comparative implications: the presence of integrated intelligence cannot be established on the basis of a single isolated feature. A high-quality product, an extended dialogue, numerous generated alternatives or strong human involvement may also arise from the purely instrumental use of AI. A coherent configuration of conditions is required: a purposefully organised context; recursive transformation of human and machine-generated contributions; at least one clearly identifiable form of resonance; functional co-creation; a traceable genealogy of the final product; and human validation and accountability.

Integrated intelligence is therefore not a general label for successful human–AI co-operation, but a testable theoretical claim about a specific organisation of interaction. Its acceptance depends both on the quality of the outcome and on empirical evidence of the processes and relationships through which its particular form arose.

Defining integrated intelligence as a possible systemic manifestation emerging through a coherent configuration of resonance, recursive transformation, asymmetrical co-creation, traceable product genealogy, and human responsibility is an authorial conceptualisation that is not reducible to existing theories of human-machine symbiosis, augmented cognition, hybrid intelligence, and co-creativity.

15. Summary

The literature review shows that integrated intelligence has recognisable theoretical premises, but cannot be reduced to a mechanical collection of existing concepts. Each of the examined traditions illuminates a separate aspect of the studied phenomenon, but at the same time has its own explanatory limits. It is the intersection of these boundaries that justifies the need to formulate the new construct.

The author's contribution does not consist in the assertion that resonance, co-creation or emergence are completely unknown phenomena, but in their specific conceptual connection. Cognitive, creative, and emotional resonance are seen as mechanisms for mutually conditioned transformation of human and machine-generated contributions. Asymmetrical co-creation is seen as a form of their organised participation. The co-created product is understood as a traceable result of the interaction. Integrated intelligence is seen as a possible systemic manifestation of the overall configuration.

The literature review outlines a programme for subsequent empirical research. It should include comparisons among independent, instrumentally supported and recursively co-creative work; the tracking of changes across successive versions of the product; the distinction between process and outcome indicators; and verification of the reliability of the proposed criteria across different participants, tasks and AI models. In this way, the literature synthesis not only identifies a theoretical gap, but also specifies the conditions under which the construct of “integrated intelligence” may receive empirical support, have the limits of its applicability delineated, or be rejected. The concept is thus presented not as a presupposed given, but as a testable theoretical claim.

Table 9. *Critical synthesis of research traditions*

<i>Tradition</i>	<i>Primary sources</i>	<i>Explanatory contribution</i>	<i>Remaining limit</i>
Symbiosis and augmentation	Licklider (1960); Engelbart (1962)	Functional complementarity and enhancement of human intellectual abilities.	Does not sufficiently define the co-creative function or the genealogy of the shared product.
Distributed and augmented cognition	Hutchins (1995); Clark and Chalmers (1998); Hollan et al. (2000)	Cognition can be distributed across people, technical artefacts and environments.	The distribution of cognitive processes does not by itself explain their recursive integration.
Collective and organisational intelligence	Nonaka and Takeuchi (1995); Lévy (1997); Malone et al. (2010)	Explains the coordination and institutionalisation of knowledge.	Retains a primarily human and organisational focus and does not clarify the specific role of generative AI.
Hybrid intelligence	Dellermann et al. (2019); Akata et al. (2020)	Functional combination of human and machine capabilities.	Does not always clarify mechanisms of resonance, recursive transformation or the co-creative function.
Human-centred AI	Shneiderman (2022)	Affirms human control, values, reliability and responsibility.	Normative conditions do not explain how the particular form of the joint product arises.
Collaborative and computational creativity	Boden (2004); Colton (2008); Davis et al. (2015)	Explains generativity, the production of variants and iterative creative interaction.	Does not always differentiate stimulation, resonance, functional co-creation and academic authorship.
Affective interaction	Picard (1997); Norman (2004); Nass and Brave (2005)	Investigates emotional signals, human experience and communicative adaptation.	Does not imply machine experience; emotional resonance must be interpreted asymmetrically.
Emergence	Holland (1992, 1998); Crutchfield (1994); Bedau (1997); Wimsatt (1997); Goldstein (1999); Ronald et al. (1999); Corning (2002); Sawyer (2003, 2005); de Haan (2006)	Explains the emergence of new system properties, organisational structures, and synergistic configurations from dynamic interactions between components. Process approaches allow emergence to be explored by tracing the transitions between successive states and levels.	The novelty of the result is not sufficient evidence of emergence. A traceable genealogy of the product is required, showing how human and machine contributions have been transformed, combined or discarded. This operationalisation is not fully developed in existing theories.

BASIC CONCEPTS AND DEFINITIONS RELATED TO INTEGRATED INTELLIGENCE

This chapter develops the conceptual apparatus underpinning the framework and defines the relationships among actors, the environment, processes, functional roles, relational mechanisms, outcomes and systemic manifestation. The concepts do not form a linear evolutionary sequence; rather, they belong to different analytical levels and may manifest in different configurations depending on the task, context and organisation of the interaction.

The framework distinguishes three categories: established concepts; established concepts adapted by the author on recognised theoretical foundations; and constructs developed by the author. This distinction does not assess their scholarly significance; rather, it indicates their origin and the type of justification required for each category. The “cognitive resonator”, the “co-creative dialogue space”, cognitive, creative and emotional resonance considered as an integrated system, “asymmetrical co-creation” and the specific configuration of “integrated intelligence” are defined as authorial constructs or conceptual syntheses developed by the author.

1. Architecture of the conceptual apparatus

Table 10 presents the levels of the core conceptual apparatus and their functions within the conceptual framework. Their arrangement is analytical rather than chronological. In empirical analysis, movement between the levels is bidirectional: from actors and context to processes and outcomes, and conversely, from the characteristics of the final product to the reconstruction of the roles, decisions and transformations that led to its creation. The conceptual apparatus therefore supports both the systematic description of the case under study and an assessment of whether the conclusion that integrated intelligence is present is sufficiently grounded in empirical evidence.

Table 10. *Levels of the conceptual apparatus*

<i>Level</i>	<i>Basic concepts</i>	<i>Function within the framework</i>
Participants and context	Human agent; AI system/agent; socio-technical context.	Defines the components, roles and conditions.
Environment and process	Co-creative dialogue space; dialogic move; recursive loop; co-creative episode.	Determines where and how the interaction takes place.
Functional roles of AI	Cognitive resonator; creative resonator; emotional-communicative modulator; a source of creative stimulation.	Describes the distinguishable functions of the system in the particular process.
Relational mechanisms	Cognitive, creative and emotional resonance; functional reciprocity.	Describes the mutually conditioned transformation.
Organisation of participation	Asymmetrical co-creation.	Defines the conditions for real and traceable co-creative contribution.
Results	Co-created product; emergent knowledge; decision; model or artefact.	Describes the specific results of the process.
System level	Integrated intelligence.	Describes a possible systemic manifestation of the entire configuration.

2. Human agent

A human agent is a cognitive, social and moral entity capable of formulating or adopting goals, interpreting context, evaluating information, creating meaning, making decisions and regulating its own actions (Bandura, 1991, 2001; Emirbayar & Mische, 1998). As a moral agent, a human being makes value judgements and is responsible for their decisions, actions and consequences. A human agent may be either an individual or an organised human collective, provided that the mechanisms for forming shared goals, making decisions, exercising control and attributing responsibility can be ascertained (Bandura, 2001; List & Pettit, 2011).

In co-creative interaction, the human participant is not a passive recipient of machine-generated results. They set or change the direction of the work, interpret proposals, evaluate their relevance, validity and veracity, accept, reject or modify individual contributions, and validate the final product (Lubart, 2005; Davis et al., 2015; Shneiderman, 2022). The human role includes intentionality, experience, meaningful interpretation, and value judgement, as well as taking academic, professional, or moral responsibility. Therefore, the involvement of AI does not negate the leading role of the human in defining the goals, verifying the content, validating the result and taking responsibility for its use.

3. AI system, model and agent

An AI system is a technical system that processes data and performs tasks through one or more models, algorithms, and other software components. An AI model is a computational component of a system that can generate predictions, classifications, text, images, or other outputs. An AI agent is a system or functional configuration that perceives information about the environment, selects and executes actions, and functions with a degree of autonomy to achieve set goals (Wooldridge & Jennings, 1995; Franklin & Graesser, 1997; ISO/IEC, 2022; Russell & Norvig, 2021).

A generative language model should not automatically be defined as an autonomous agent. The model itself generates outputs based on the supplied context. It can be incorporated into an agent system when it is associated with memory, goals, planning mechanisms, feedback, and the means to perform actions in the environment (Yao et al., 2023). In a dialogic environment, a model can perform a limited agent-like function when it maintains context, generates responses, and engages in a sequence of mutually conditioned communicative actions. This functional involvement is not a sufficient basis for ascribing to it independent human-like intention, understanding, consciousness, or moral responsibility (Bender et al., 2021; Shanahan, 2024).

The distinction between system, model, and agent is also important in determining the unit of analysis. The model denotes the computational mechanism. The system includes the model and other technical and organisational components, such as interface, rules of operation, memory, tools and environment of use. Agent function refers to how the particular configuration perceives the state of the environment, maintains or pursues a goal, and participates in a sequence of actions. Agency is therefore attributed to a particular functional organisation of the system, not automatically to the model or to each individual response it generates.

4. Dialogue and co-creative dialogue space

Human–AI dialogue is a purposeful process of sequential exchange in which human inputs, responses and decisions, together with machine-generated outputs, establish the conditions for subsequent moves in the interaction. The influence of a machine-generated output is not automatic; it occurs when the output is perceived, interpreted or used by a human participant, or incorporated by the system into the subsequent context. Dialogue may remain primarily instrumental or become recursive and co-creative when the participants' contributions repeatedly prompt the evaluation, reformulation and transformation of the product under development (Pask, 1976; Davis et al., 2015; Amershi et al., 2019).

A co-creative dialogue space is an authorial construct denoting the relational, informational and communicative environment in which distinct human and machine contributions are presented, interpreted, compared, evaluated and transformed. It is not a physical place, a self-contained entity, or a shared consciousness, but a dynamically organised configuration of contexts, meanings, goals, constraints, options, feedback, decisions, and created artefacts.

The earlier term “cognitive dialogue space” primarily referred to the cognitive dimension of this environment. “Co-creative dialogue space” is the more general concept, as it includes not only the cognitive and creative processes, but also the emotional-communicative dimension of the interaction. The latter refers to human experience, expressed emotional signals and communicative adaptation of the system, without implying the presence of machine experience.

For the purposes of empirical analysis, the boundaries of the co-creative dialogue space are determined by the accessible and documented context and by the traceable evidence that contributes to the formation of subsequent moves. These traces include the current dialogue, attached materials, intermediate versions, the tools used, the constraints imposed, and human criteria and decisions. Extraneous information that is not introduced, documented, or otherwise ascertainable in the particular interaction should not be treated as an observable element of its empirical reconstruction. The possible influence of prior training, system configuration, and other unavailable technical conditions should be considered as a limitation of the analysis. This distinction increases the traceability and reproducibility of the study and limits the attribution of a causal role to undocumented factors.

5. Dialogic move, recursive loop and co-creative episode

A dialogic move is the smallest analytical unit of an interaction and comprises a single human or machine-generated contribution that may influence the subsequent development of the dialogue. A move may contain an assignment, specification, suggestion, evaluation, decision, machine output, or other functionally distinguishable contribution. Its designation as an analytical unit is based on its function in the sequence and not necessarily on its technical realisation as a separate message (Sacks et al., 1974; Pask, 1976).

A recursive loop is a connected sequence involving a human goal or input, a machine-generated output, its human interpretation and eventual transformation, and a subsequent assignment or decision. The cycle is recursive when the result of the previous moves becomes a condition for the next ones: it gives rise to a refinement of the goal, a change of the criteria, a redesign of the artefact, or a choice between options. Thus, not every sequence of human and machine

messages forms a recursive loop; a functional relationship between them must be established (Pask, 1976; Kantosalo & Toivonen, 2016).

An interaction episode is a content-specific set of one or more related moves or recursive loops organised around a relatively stable goal, task, or problem frame. Depending on the nature of the interaction, it may be instrumental, resonant, or co-creative. A co-creative episode involves one or more recursive loops through which human and machine inputs are evaluated and transformed and which result in a relatively stable product, conceptual solution, or significant change of direction.

These units of analysis allow co-creation to be examined at a specific procedural level. A project may contain instrumental, resonant and co-creative episodes; consequently, the character of the work as a whole should not be determined solely on the basis of a single move or a limited fragment of the interaction.

The beginning and the end of the episode are determined by content, not only by technical or time features. A new episode begins when there is a significant change in the goal, criteria, object of work, or problem framework. The episode ends with relative stabilisation of the product or solution, termination of the relevant line of interaction, or transition to a substantively different task. Thus, an extended conversation may contain several separate episodes, and an episode may span more than one technical session if the purpose, context, and genealogy of transformations remain traceable (Jordan & Henderson, 1995).

6. Functional roles of artificial intelligence

An AI role denotes the function performed by the system in a particular segment of the interaction, rather than a permanent, intrinsic or independent property of the system. The same system can at different times function as a tool, assistant, cognitive resonator or co-creator (Table 11). Such a functional distinction is based on research on the different forms of human-computer creative interaction, without taking the roles proposed here as a direct reproduction of an established typology (Lubart, 2005; Kantosalo & Toivonen, 2016).

Roles can change within an episode and do not form a mandatory hierarchy or scale of development. The system can, for example, function as a tool in the extraction and arrangement of data, as an assistant in the execution of a partially assigned task, as a cognitive resonator in the discovery and challenge of an assumption, and as a co-creator in traceable participation in the transformation of a concept, solution or artefact.

Role coding should be based on the observable operation of the system, how the human actor uses or transforms its output, and the detectable influence of that output on subsequent moves or on the product being created. Linguistic persua-

siveness, the complexity of the response, or the general impression of “intelligence” are not sufficient grounds for ascribing a more active role. The same machine output can perform a different function depending on its use: a suggestion that a human ignores does not automatically constitute a co-creative contribution, while a short question can function as a cognitive resonator if it leads to a detectable change in the problem frame.

Table 11. *AI Functional Roles in Dialogue*

<i>Role</i>	<i>Definition</i>	<i>Distinguishing feature</i>
Tool	Performs an explicitly specified operation or generates a requested result.	The direction and criteria are predetermined by the human participant.
Assistant	Supports work within a defined human purpose.	The contribution facilitates but does not significantly change the solution space.
Cognitive resonator	Generates contributions that stimulate rethinking, differentiation or restructuring.	Changes the development of human understanding.
Creative resonator	Expands and transforms the space of creative possibilities.	Introduces variations and connections that prompt new creative moves.
Emotional-communicative modulator	Functionally recognises emotionally meaningful signals and adapts communication.	Influences human engagement, trust and sustainability of dialogue.
Asymmetrical co-creator	Participates with a distinguishable and traceable contribution to the product’s iterative emergence.	The input modifies the solutions and remains reconstructable in the final result.

7. Creativity and creative stimulation

Here, creativity is understood as the human capacity to create and develop ideas, solutions or artefacts that are both original and relevant within a given context. AI generativity refers to the system’s technical ability to produce variants, combinations, and transformations based on dependencies learned from data. The two concepts are not identical: the generation of a new or unusual output is not in itself sufficient grounds for it to be defined as creatively significant. However, they can interact productively in human-machine dialogue.

AI-mediated creative stimulation is the functional effect of machine-generated suggestions, distinctions, combinations or alternatives on human creativity

and the reconceptualisation of ideas. It can also occur with a single machine input. When the person interprets, evaluates, or transforms this input and the result is incorporated into the next moves of the interaction, creative resonance can occur.

When evaluating creative significance, the criteria of novelty and relevance must be distinguished. An unusual machine variant can expand the search space without being actionable, while an initially simple proposition can gain creative significance through human transformation and contextualisation. Therefore, the novelty of a single machine output is not a sufficient indicator of creative contribution (Runco & Jaeger, 2012).

In the present model, creative resonance is established procedurally: through a traceable change in human ideas, criteria, or creative moves, and through the development of the idea through successive versions. It does not necessarily imply the inclusion of the machine version in the final product. When a distinguishable machine input participates in the recursive transformation of the product and remains reconstructable in its genealogy, the interaction can be coded as asymmetrical co-creation (Kantosalo & Toivonen, 2016).

8. Cognitive resonance

Cognitive resonance in human–AI interaction occurs when a question, suggestion, criticism, or distinction changes the way a person understands and structures the problem at hand. Such change may be evidenced by:

- introducing a new distinction;
- reformulating the problem;
- detecting contradictions;
- revision of an assumption or criterion;
- establishing new relationships between the elements of the problem;
- constructing, transforming or rejecting a conceptual model;
- re-evaluating possible solutions;
- formulating a new question.

Cognitive resonance does not require consent. Criticism and productive disagreement can also trigger it. This happens when they change human understanding and guide the further development of dialogue.

In humans, resonance is expressed as a change in understanding, assumptions or conceptual models. But without further data, it cannot be determined whether this change is permanent. In an AI system, no internal change in understanding can be established; only functional change can be observed. The system adapts its subsequent responses to the context created during the interaction. Therefore, cognitive resonance is not determined by the content or

persuasiveness of an individual AI response. It is established by tracking the impact of the response on human understanding and on subsequent moves in the dialogue.

9. Creative resonance

Creative resonance in human–AI interaction occurs when human and machine-generated inputs mutually guide the development of the creative process. Each subsequent contribution builds on what has already been created and can change the space of possible solutions.

Creative resonance does not consist merely in generating an original variant or accumulating multiple ideas. It can be established when a contribution leads to the transformation of an idea, the discovery of a new direction, the introduction of a different criterion, or the discovery of an unexpected connection. It is necessary that the change that occurs affects the next moves in the interaction.

Creative resonance can stimulate human creativity, but it does not replace it. The human participant determines the goals, interprets the proposals and evaluates their relevance. Artificial intelligence participates by generating, combining and transforming variants. The particular creative output may arise from the recursive interaction between human judgement and machine generativity.

Creative resonance is present when the interaction leads to a traceable development or transformation of an idea. Creative stimulation, by contrast, denotes an initial impetus to human creativity. It can give rise to a new association, idea or direction without developing into a sustained process of mutual transformation. Creative stimulation may therefore be an initial effect, whereas creative resonance entails its development within the recursive dynamics of interaction.

10. Emotional resonance

In human–AI interaction, emotional resonance constitutes an asymmetrical relational dynamic. The human participant may experience a feeling of being understood, as well as trust, closeness, motivation, inspiration, or some other emotional response. Artificial intelligence only functionally recognises the emotionally and semantically significant signals in the dialogue. Based on them, the system adapts the tone, structure and content of its subsequent responses.

The concept does not imply that the AI possesses human-like feelings or subjective emotional experience. Emotional resonance is a property of communicative dynamics, not an internal state of the system. AI responses can affect human experience. The resulting change may increase the depth, continuity and creative productivity of the ensuing dialogue.

Emotional resonance should be distinguished from anthropomorphisation. Anthropomorphisation is the attribution of human qualities to non-human objects or systems. Such qualities may include feelings, intentions, consciousness, understanding, will and moral responsibility. When interacting with AI, anthropomorphisation occurs when a person assumes that the system:

- actually feels joy, sadness, or sympathy;
- has its own desires and intentions;
- understands experiences in a human way;
- knowingly seeks to help or harm;
- has a persistent character or a personal attitude towards the interlocutor.

Anthropomorphisation occurs relatively easily because AI uses natural language, tailors its responses to context, and can convincingly express empathy. However, this behaviour does not prove the existence of a subjective experience. The system can functionally recognise emotional signals and adapt its responses to them without experiencing human-like feelings.

Therefore, the two concepts denote different phenomena. In anthropomorphisation, the human participant ascribes internal human states to the AI. Emotional resonance examines the impact of communication on the human participant and the functional adaptation of the system. For such resonance to exist, it is not necessary to assume that the AI experiences emotions.

It is necessary to distinguish between emotional involvement, trust in the system and a reasoned decision to use it. A positive tone can encourage participation and keep the dialogue going. However, it may mask uncertainty or create an impression of greater reliability, thereby increasing the risk of uncritical acceptance of the system's claims.

Therefore, emotional resonance has a positive function only when coupled with critical scrutiny, awareness of limitations, and proper calibration of trust. Trust in the system must correspond to its actual capabilities and reliability in the specific context (Lee & See, 2004).

11. Functional reciprocity

Functional reciprocity means that the contribution of each party to the interaction is formed in relation to the previous contribution of the other and can, in turn, change the conditions for its next move. It does not presuppose equivalence between humans and AI systems in terms of subjective experience, cognitive capacities or moral responsibility.

Humans can change their goals, understandings, and decisions. The AI system modifies its next outputs based on context, feedback received, and new instructions. This asymmetry is a constitutive feature of human–AI interaction, not a flaw to be overcome.

Functional reciprocity must be distinguished from symmetrical agency. Human and machine inputs mutually influence the flow of the process. However, this does not mean that humans and AI systems have equivalent capacities for goal-setting and understanding. Nor does it mean that AI can be ascribed moral responsibility equal to that of humans.

The concept describes the mutual conditionality of contributions at the process level. It allows the impact of AI to be explored without equating the technical adaptability of the system with human subjectivity.

12. Asymmetrical co-creation

Asymmetrical co-creation is a relational process in which the human participant and the AI system contribute to the emergence of a shared product. Their contributions are different in nature but mutually conditioned.

Artificial intelligence performs a co-creative function when four conditions are present. Its contribution should be discernible. It must participate in the iterative transformation of the product being created, influence the space of possible solutions and have a traceable role in the final result.

Co-creation is not the same as co-authorship. The human participant remains the bearer of authorial intention. The human participant retains responsibility for meaning and value judgement, final validation, and academic or moral accountability. Artificial intelligence can perform a genuine co-creative function at the functional and process level without acquiring the normative status of an author.

The four conditions (distinguishable contribution, participation in iterative transformation, influence on the space of possible solutions, traceable role in the final product) are cumulative when a strong inference of co-creation is made. If the machine input is discernible but does not participate in subsequent transformation, it is more accurate to speak of stimulation or assistance. If there is an iterative transformation, but the role of AI in the final product cannot be reconstructed, the claim of co-creation remains insufficiently substantiated. Borderline and negative cases are therefore part of the definition, not a departure from it.

13. Co-created product

The co-created product can be an idea, text, model, figure, solution, hypothesis, or other artefact. Its specific form emerges through the sequential interaction and transformation of distinct human and machine inputs. The product is not a mechanical sum of these contributions. Nor does it need to contain verbatim machine-generated text.

A co-creative origin is established through the genealogy of the product. It may be reconstructed from the dialogue history, successive versions and the

author's notes. The map of accepted, amended and rejected proposals is also important. The quality of the finished product is a separate matter. By itself, it does not prove the existence of co-creation.

The genealogy should cover accepted proposals and significant rejected options. It should reflect the rationale for edits and changes in human criteria. These traces make it possible to determine whether machine input has changed the space of possible solutions. They also indicate whether the system only provided material to follow a predetermined direction.

That is why traceability is a necessary condition for a substantiated claim of co-creative origin. It makes it possible to reconstruct the origin of the product and to determine the role of AI in this process. Traceability is therefore part of the evidentiary basis of a claim of co-creation, not merely accompanying documentation.

14. Emergent knowledge

Emergent knowledge is a cognitive output that is formed through the interaction and sequential transformation of human and machine inputs. It can take the form of a reasoned understanding, a conceptual relationship, a model, or a solution. This result is not fully present in any of the individual human or machine contributions. Its emergence can be traced to the interaction and successive transformation of these contributions. Such an understanding is based on the notion that knowledge can emerge through the interaction and transformation of different forms of knowledge (Nonaka & Takeuchi, 1995).

Not every new or original result acquires the status of knowledge. This requires human interpretation, appropriate verification, and inclusion in a relevant meaningful context. Artificial intelligence can participate in the formation of informational and conceptual material. Epistemic validation of the result, however, remains a human task. In a scientific or professional context, it may also require institutionally recognised verification procedures.

The method of verification depends on the type of claim. Conceptual models require evaluation of their logical coherence and explanatory value. Factual statements should be cross-referenced with reliable, preferably primary, sources. Empirical findings are subject to methodological scrutiny. Applied solutions require expert or practical evaluation according to the purposes and conditions of use.

In this way, emergent knowledge is distinguished from both the plausibly generated text and the personal impression that the resulting output is new. To acquire the status of knowledge, a result must be substantiated and verified by procedures appropriate to the type of claim. Its status depends not only on the

mode of occurrence, but also on the quality of the grounds by which the result is accepted as valid.

15. Integrated Intelligence

Integrated intelligence is an emergent, relational, and dynamic form of intellectual organisation. It may manifest within a sociotechnical system when distinct human and machine-generated contributions are mutually transformed through purposive and recursive dialogue, resonance and asymmetrical co-creation. The result is a co-created product for which meaning-making, value judgement, final validation and moral responsibility remain with the human participant.

Integrated intelligence has three interrelated statuses. Conceptually, it is a central authorial metaconstruct in the proposed theoretical framework. Ontologically, it denotes a possible systemic manifestation of a specific organisation of relations between the human, the AI system, the interaction process and the emerging product. Methodologically, it represents an analytical configuration. It is established through the processes of resonance, the criteria of asymmetrical co-creation, the traceable genealogy of the product and the preserved human responsibility.

Integrated intelligence is not an independent entity, a form of general consciousness or a possession of AI. It does not automatically manifest whenever AI is used. Nor should it be seen as necessarily the highest degree of technological development.

The definition follows a configurational logic. Separate resonance, a one-off original result, or high efficiency are not sufficient grounds for establishing integrated intelligence. Such an inference requires the coexistence of a purposeful and recursive process, the reciprocal transformation of distinguishable contributions, asymmetrical co-creation, a traceable product genealogy, and final human validation and accountability. The degree of manifestation may vary. However, the minimum conditions and evidence of their fulfilment must be explicitly stated for each analysed case.

16. Differentiating integrated intelligence from related constructs

A clear distinction between integrated intelligence and related constructs is essential to the overall conceptual framework. They can intersect with it and provide theoretical grounds for certain of its features. None of them, however, encompass the entire configuration of purposive and recursive dialogue, resonance, asymmetrical co-creation, co-created product, traceable genealogy of its emergence, and preserved human responsibility. Table 12 distinguishes these constructs according to their principal explanatory focus.

Table 12. *Distinguishing integrated intelligence from related constructs*

<i>Construct</i>	<i>Main focus</i>	<i>Link to integrated intelligence</i>
Augmented intelligence	Augmentation of human cognitive and practical abilities through AI.	Can provide a functional basis for interaction, but does not require resonance, mutual transformation of contributions, or co-creation.
Hybrid Intelligence	Combining and complementing human and machine capabilities in problem solving.	Describes the functional configuration of the collaborative activity, but does not necessarily require asymmetrical co-creation and a traceable genealogy of a co-created product.
Collective Intelligence	Coordinating the contributions of multiple human, machine, or mixed actors.	It can be a medium for the manifestation of integrated intelligence, but multiplicity of participants is not its necessary condition.
Organisational intelligence	Creating, sharing, using and institutionalising knowledge in the organisation.	Denotes an organisational level of analysis within which manifestations of integrated intelligence may arise and be identified.
Symbiotic Intelligence	Sustained mutual adaptation and complementarity of human and machine components over time.	It may represent a lasting form of development of integrated intelligence, but continued symbiosis is not necessary for a single co-creative episode.
Distributed Cognition	Distribution of cognitive processes among people, artefacts, practices, and environment.	Provides a theoretical basis for the analysis of the system organisation of the cognitive process, but does not determine conditions for the co-creative origin of the product.
Extended Cognition	Functional incorporation of external means and artefacts into human cognitive activity.	Explains how an AI system can participate in the cognitive process, but does not itself imply resonance, co-creation or co-created product.
Integrated Intelligence	A configuration of purposive and recursive dialogue, resonance, asymmetrical co-creation, a co-created product, a traceable genealogy of its emergence, and preserved human responsibility.	Has its own explanatory focus. It does not constitute a sum, a generalising category or a mandatory final stage of the other constructs.

The configuration described in Table 12 brings together interrelated conditions that distinguish integrated intelligence from the ordinary use of AI. Its presence may be established on the following grounds:

- Purposeful dialogue sets the problem, goal, and criteria of the interaction. Without such directionality, the exchange may remain haphazard or be reduced to the one-off use of the system as a content-generation tool.
- Recursive dialogue involves successively returning to what has already been created, evaluating it, and transforming it. A single request and the resulting response alone are not sufficient to establish integrated intelligence.
- Resonance denotes an interaction-induced change in human understanding, criteria, questions, or direction of work. It is not exhausted by consent, satisfaction or emotional response.
- Asymmetrical co-creation means that distinct human and machine-generated contributions participate in the formation of the product and are transformed in the course of the interaction without acquiring equal status. The human participant determines the goals and the meaning, evaluates the proposals, approves the result and bears the responsibility for its use.
- The co-created product is a result whose specific form is not fully present in any of the individual contributions, but arises through their successive interaction and transformation.
- The traceable genealogy of the product makes it possible to reconstruct how the proposals accepted in full or after amendment, as well as the essential rejected variants, influenced its formation. It does not in itself create the co-creative origin, but provides an evidentiary basis for its establishment.
- The retained human responsibility defines the normative limit of the configuration. The AI's participation does not transfer meaning-making, value judgement, final validation or moral responsibility to the system.

The components of the configuration belong to different but related levels of analysis: dialogue, resonance, and transformation of contributions describe the process; asymmetrical co-creation characterises the mode of creation; the co-created product is the result; the product's genealogy provides evidentiary traceability; human responsibility determines the normative distribution of roles.

Their relationship is not mechanical or strictly linear. Purposeful and recursive dialogue creates the conditions for resonance and transformation of contributions. The resulting changes may in turn generate new resonance and redirect the dialogue. Through this recursive process, the co-created product is formed. Its genealogy allows the process to be reconstructed, and the preserved human responsibility determines who interprets, evaluates and finally validates the result and who is responsible for its use.

17. Scholarly status and theoretical foundations

Tables 13 and 14 present the concepts according to their status within the conceptual framework and the principal theoretical and terminological sources on which the conceptual apparatus is based.

The two tables perform different functions. Scholarly status indicates whether a concept is borrowed from an established scholarly tradition, adapted and specified for the purposes of the present framework, or constructed by the author. The theoretical and terminological foundations show from which scholarly traditions, theories and standards its characteristics are derived. The distinction prevents the author's syntheses and operationalisations from being presented as already validated and generally accepted constructs, and highlights the need for their subsequent theoretical and empirical verification.

Table 13. *Status of the main concepts in the conceptual framework*

<i>Concept</i>	<i>Status within the framework</i>	<i>Basis</i>
Human agent and human agency	Established concepts specified for the purposes of the framework.	Social-cognitive theories of agency, human autonomy and responsibility.
AI system and AI agent	Established technical and terminological concepts.	Research in the field of AI and multi-agent systems; terminology standardisation.
Human–AI dialogue and interaction	Established concepts and research areas adapted to the co-creative process.	HCI, Human–AI Interaction and conversation theory.
Distributed and augmented cognition	Established but different theoretical approaches.	Distributed Cognition and Extended Mind.
Hybrid, collective and organisational intelligence	Established research constructs belonging to different levels of analysis.	Hybrid Intelligence, Collective Intelligence and Organisational Intelligence.
Cognitive resonator	Authorial construct.	Synthesis of Augmented Human Intelligence, Distributed Cognition, Collaborative Cognitive Systems, and Human–AI Interaction.
Co-creative dialogue space	Authorial construct.	Synthesis of dialogic approaches, computational co-creativity, and human–AI interaction.

<i>Concept</i>	<i>Status within the framework</i>	<i>Basis</i>
Cognitive, creative and emotional resonance	Author's adapted and specified concepts with interdisciplinary grounds.	Dialogic cognition, computational co-creativity, affective computing, and adaptation in interaction.
Asymmetrical co-creation	Author-specified construct whose terminological originality is subject to bibliographic verification.	A synthesis of Human–AI Collaboration, Co-Creativity, Human-Centric AI, and Theories of Responsibility.
Co-created product	Established general concept adapted through the author's definition and operationalisation within the framework.	Theories of co-creation, process analysis and traceability of human and machine-generated contributions.
Integrated Intelligence	Central authorial metaconstruct.	A configurational synthesis of purposive and recursive dialogue, resonance, asymmetrical co-creation, co-created product, and preserved human responsibility.

Table 14. *Main theoretical and terminological foundations of the conceptual apparatus*

<i>Conceptual domain</i>	<i>Terms, directions, standards</i>	<i>Representative sources</i>
Human agency and responsibility	Social Cognitive Theory; Human-Centred AI; human agency.	Bandura (1986, 2001); Shneiderman (2022).
Augmenting human intelligence	Intelligence Augmentation; human–computer symbiosis.	Licklider (1960); Engelbart (1962).
AI system and agent	Artificial Intelligence; intelligent agents; multi-agent systems; terminology standardisation.	Wooldridge and Jennings (1995); Wooldridge (2009); Russell and Norvig (2021); ISO/IEC 22989:2022.
Human–AI dialogue and interaction	HCI; Human–AI Interaction; conversation theory.	Pask (1976); Dix et al. (2004); Amershi et al. (2019).
Systemic, distributed and extended cognition	Distributed Cognition; Extended Mind; Joint Cognitive Systems.	Hutchins (1995); Clark and Chalmers (1998); Hollnagel and Woods (2005).
Creativity and co-creation	Computational Creativity; human–computer co-creativity; computational co-creation.	Boden (2004); Lubart (2005); Colton (2008); Davis et al. (2015).

<i>Conceptual domain</i>	<i>Terms, directions, standards</i>	<i>Representative sources</i>
Emotional and social dynamics	Affective Computing; emotional design; social responses to technology.	Picard (1997); Norman (2004); Nass and Brave (2005).
Emergence and complex systems	Emergence; complex adaptive systems.	Holland (1992, 1998); Goldstein (1999).
Organisational knowledge creation	Organisational knowledge creation; organisational learning.	Nonaka and Takeuchi (1995).
Hybrid and human-centred interaction	Hybrid Intelligence; Human-Centred AI.	Dellermann et al. (2019); Akata et al. (2020); Shneiderman (2022).

18. Configuration model

In the conceptual framework, cognitive, creative and emotional resonance are seen as interacting process dimensions of integrated intelligence, and asymmetrical co-creation as a specific way of organising human and AI system participation in product formation. None of the related constructs considered is a necessary prerequisite or antecedent, or an inevitable step towards integrated intelligence. Its specific manifestation depends on the configuration and functional connectivity of processes, roles, contextual conditions and outcomes.

The configuration model allows for different manifestation profiles. In one configuration, cognitive resonance may dominate, and in another, creative resonance. Emotional resonance may aid the process, be of limited importance, or pose risks, for example through uncritical trust, excessive attachment, or weakening of human judgement. Therefore, the three forms of resonance define the possible dimensions of the profile, without the need for each of them to be present with high intensity or positive effect in any particular configuration.

Accordingly, integrated intelligence is not determined by the maximum level of each individual dimension, but by the way in which at least one detectable form of resonance forms part of a functionally connected process of asymmetrical co-creation. In this process, human and machine-generated inputs are not simply present simultaneously, but undergo recursive evaluation, selection and transformation through which the product is formed.

The traceable genealogy of the product provides an evidentiary basis for reconstructing and substantiating this process, without itself constituting a condition for the process to occur. Preserved human responsibility determines its normative limit. Individual components may have different relative weights, but a configuration can be defined as integrated intelligence only when all of the following are present:

- purposeful and recursive dialogue;
- at least one detectable form of cognitive, creative, or emotional resonance;
- asymmetrical co-creation, where human and machine-generated contributions are evaluated, selected and transformed in the course of product formation;
- a product whose specific form arises through this interaction;
- retention by the human participant of responsibility for meaning-making, value judgement, final approval, and the result and its use.

Differences in the relative strength, direction, and combination of the three forms of resonance result in different manifestation profiles. The traceable genealogy provides the evidentiary basis for reconstructing and substantiating the co-creative process. Its specific manifestation is modified by the task, the characteristics of the participants, the technology used, the time conditions and the organisational environment.

Integrated intelligence does not require all forms of resonance to be strongly manifested at the same time. The presence of the mandatory procedural and normative core and the functional connectivity between its components, which leads to the emergence of the jointly formed product, are decisive.

19. Summary

The conceptual apparatus distinguishes components, processes, functional roles, relational mechanisms, participatory organisation, outcomes and systemic manifestation. This prevents concepts from different analytical levels from being conflated. AI is a technical component, a resonator is a functional role, and resonance is a process. Co-creation denotes the organisation of participation, the product is a result, and integrated intelligence is a systemic metaconstruct.

The logic of the framework can be summarised as follows. In the co-creative dialogue space, human and machine-generated contributions can come into cognitive, creative or emotional resonance. In the course of the interaction, contributions are recursively evaluated, selected, and transformed. When machine-generated input is distinguishable and transformative, interaction takes the form of asymmetrical co-creation. Traceability of contributions provides an evidentiary basis for reconstructing the co-creative process.

A co-created product may emerge through this configuration. The human participant retains responsibility for meaning-making, value judgement, final approval, and the result and its use. When these processual and normative features are present, the configuration can be explored as a possible manifestation of integrated intelligence.

PHILOSOPHICAL FOUNDATIONS OF INTEGRATED INTELLIGENCE

The development of AI requires a philosophical rethinking of the relationships between intelligence, cognition, creativity, agency, and responsibility. A significant proportion of existing approaches considers AI as a tool, an assistant or an autonomously functioning technical system. These definitions are necessary but do not fully cover the full range of interaction. In some of them, machine-generated contributions transform human understanding, expand the space of creative possibilities, and make a traceable contribution to the formation of a shared product.

The conceptual framework proposed here shifts the analytical focus to the relational and sociotechnical configuration of interaction. This does not erase the differences between the human participant and the AI system. On the contrary, the theory assumes a functional, ontological and normative asymmetry.

Human beings possess intentionality and subjective experience. They attribute and evaluate meaning, make value judgements, approve the final product and retain responsibility for the result and its use. AI participates through analytical, generative and context-transformative capabilities. This participation in itself does not imply consciousness, intention, or moral responsibility.

The main philosophical thesis is that, under certain conditions, cognitive, creative and emotional resonance can occur in the co-creative dialogue space. A functional reciprocity can be established between the human participant and the AI system while maintaining asymmetry. This reciprocity is organised as a form of asymmetrical co-creation.

Emotional resonance does not imply emotional experience on the part of the AI. It indicates how machine-generated responses can influence the human participant's emotional state and the dynamics of the interaction.

These processes do not create a common consciousness or a new moral subject. However, they can form a systemic organisation through which a co-created product emerges. The particular form of this product is not fully specified in advance by the independent contribution of any participating component. It cannot be fully explained by just one of them.

The philosophical framework is explanatory in nature. It defines the conditions under which interaction can be studied as integrated. At the same time, it indicates the grounds on which such a definition should be rejected.

The concepts of “resonance,” “co-creation,” and “emergence” function as analytical categories. Their application requires traceable evidence of the process and the product. These characteristics cannot be attributed in advance to any human–AI system.

1. From an individualistic to a relational and systemic understanding

Individualistic approaches view intelligence primarily as an ability or property of the individual carrier. A relational perspective does not deny individual capabilities. It directs attention to the way in which the cognitive process changes depending on the organisation of relations between people, technical systems, artefacts and the environment. The unit of analysis becomes not only the individual component, but the entire configuration and the interactions within it. This position is based on general systems theory, distributed cognition, and the extended mind thesis (von Bertalanffy, 1968; Hutchins, 1995; Clark & Chalmers, 1998).

Relationality does not imply that human and AI have the same ontological, functional, or normative status. It means that the contribution of each component can change the conditions under which the next action in the system takes place. Machine-generated input can transform human interpretation, evaluation criteria, or choices of action. Subsequent human feedback in turn modifies the context that shapes subsequent machine output. This interdependence remains asymmetrical. Sustained changes in a person’s understanding, skills, or creative intentions may occur. However, changes in machine output are usually contextual and limited to the particular interaction. They can be defined as persistent only if the system stores and uses the accumulated context in subsequent interactions.

Relational analysis must distinguish the functional and causal role of relationships from the simple co-presence of components. It is not enough for the human participant and the AI to participate in the same task. It is necessary to establish how a particular input modifies a subsequent interpretation, criterion, or action, and how this modification contributes to the formation of the result. Thus, the systems perspective does not dilute individual contributions. It situates them within a traceable and verifiable configuration of dependencies.

Table 15. *Philosophical and interdisciplinary traditions relevant to integrated intelligence*

<i>Tradition</i>	<i>Main thesis</i>	<i>Contribution to the framework</i>	<i>Primary authors</i>
General Systems Theory	The properties and behaviour of a system depend on the organisation and relationships between components.	Justifies systemic and configurational analysis.	Ludwig von Bertalanffy
Emergentism	In a particular organisation, system-level properties may emerge that are not individually attributed to components.	Provides a basis for investigating a possible systemic manifestation without presupposing it.	C. D. Broad; Mario Bunge; Mark Bedau
Distributed and augmented cognition	Cognitive processes can, under certain conditions, encompass people, artefacts, and elements of the environment.	Justifies the relational and sociotechnical level of analysis.	Edwin Hutchins; Andy Clark; David Chalmers
Philosophy of dialogue and dialogism	Meaning is formed and transformed in relations of address, response and interpretation.	Supports an understanding of the co-creative dialogue space.	Martin Buber; Mikhail Bakhtin
Pragmatism and reflective practice	Knowledge is developed through action, problematization, feedback and correction.	Justifies the recursive transformation of understandings and actions.	John Dewey; Donald Schön
Ethics of human-centred AI	The development and use of AI must support human autonomy, dignity, control and responsibility.	Justifies normative asymmetry and the preservation of human responsibility.	Luciano Floridi et al.; UNESCO; EU High-Level Expert Group on AI

2. Ontological grounds of integrated intelligence

Considered ontologically, integrated intelligence is a possible systemic manifestation of coordinated cognitive and creative activity. It arises in a particular organised configuration, but is not a self-contained substance, general consciousness, or inherent property of an AI system. The configuration includes human actors, AI systems, context, technical and informational resources, and a co-creative dialogue space. In it, processes of resonance and recursive transformation take place. As a result, joint products are formed, in which traceable evidence of the contributions of the participants remain. This understanding is based on systems ontology and a moderate conception of emergentism. Systemic manifestation depends on the organisation and interactions between components. There-

fore, it cannot be attributed to any of them in isolation (von Bertalanffy, 1968; Bedau, 1997; Bunge, 2003).

Not every sociotechnical system is an environment for the manifestation of integrated intelligence. Such a manifestation is possible only in a coherent co-creative configuration. The relationships between the components must have a traceable and transformative influence on the process and the outcome. Integrated intelligence is procedural, relational, contextual and episodic in nature. Therefore, it is more accurate to speak of a “manifestation in the configuration” rather than of a permanent property. If the configuration is terminated or substantially changed, the grounds for this attribution may no longer obtain.

Co-creation represents a real functional and relational form of participation. An AI system can act as a co-creator if its input is distinguishable and involved in the iterative transformation of the product. This contribution must change the space of possible solutions and remain traceable in the result. Such an understanding is compatible with research on human-computer co-creation. This research emphasises interaction around a shared product, the mutual influence of contributions and the dynamics of the creative process (Davis, 2013; Kantosalo & Takala, 2020; Rezwana & Maher, 2023). However, functional co-creation does not presuppose human-like subjectivity, phenomenal experience, independent intentions, or moral agency.

The ontological threshold is determined by the organisation and transformative dynamics of the process. Technical sophistication, degree of automation and linguistic persuasiveness alone are not enough. A single machine output, automatic editing, or selection between preset options is not enough either. Recursive, asymmetrical and reciprocal transformation is required.

Recursiveness means that successive human and machine inputs become input for subsequent actions. The asymmetry stems from the different roles of the participants. The human participant sets the goals, interprets meaning, makes value judgements and confirms the result. The AI system transforms the content and the space of possible solutions within the limits of its technical constraints. This transformation must be sustained within the particular interaction. The machine contribution must have a traceable explanatory significance for the form of the product. It is not enough that the result is merely different from what it would have been without AI. The difference must arise from the recursive interaction and substantially affect the trajectory, structure, or content of the product.

The explanatory significance of machine contribution does not prove the existence of machine subjectivity. Functional involvement, causal impact, co-creation, authorship, and moral agency are distinct analytical categories. An AI system can make functionally and causally relevant contributions without becoming a morally responsible entity. The relational approach allows one to account for

the role of technical components in the sociotechnical configuration without automatically equating them with moral agents (Coeckelbergh, 2020). Moral and institutional responsibility rests with human and organisational actors according to their roles, decisions and powers.

The human participant retains responsibility for meaning and value judgement. The human participant makes the final decision and is responsible for the use of the product and its consequences. This does not mean that the organisational, institutional and technical constraints are morally neutral. Responsibility must be considered in the context of the entire configuration, while maintaining the normative asymmetry between the human participant and the AI system.

Table 16. *Ontological positions*

<i>Aspect</i>	<i>Location</i>
Status	A possible emergent systemic manifestation, not a substance, general consciousness, or autonomous entity.
Level at which it is instantiated	The organisation of a particular relational and sociotechnical configuration.
Components	Human, AI system, context, technical and information resources, dialogue space, processes and products.
Mode of existence	Processual, relational, contextual, episodic, and dependent on configuration maintenance.
Emergence	Moderate systemic emergence: the manifestation depends on the organisation and is not attributed in isolation to a single component.
Co-creation	Real functional and relational role without presupposition of symmetrical subjectivity, consciousness or responsibility.
Ontological Threshold	Recursive and asymmetrical reciprocal transformation in which the AI contribution has a traceable explanatory significance for the product.
Human position	The human participant retains responsibility for meaning and value judgement, final approval and responsibility for use and consequences.
Boundary	Does not include machine consciousness, common sense, independent moral agency, or automatic manifestation in any use of AI.

3. Epistemological grounds of integrated intelligence

The epistemological framework distinguishes the generation of information from the creation and recognition of knowledge. The AI system can produce analyses, options, connections and conceptual propositions. These outputs can make a real and sometimes necessary contribution to the particular shape of the result. However, this functional epistemic contribution is not equivalent to hu-

man understanding or self-verification. The distinction is consistent with Floridi's (2011) informational approach and with the critique of attributing understanding to language systems solely on the basis of their persuasive behaviour (Bender et al., 2021).

Epistemic validation remains the responsibility of the human participant. They interpret meaning, verify facts and supporting grounds, and assess limitations. They also situate the result in the relevant scientific, professional or practical context. Knowledge can emerge in a distributed cognitive process, but its validity requires human and institutional verification. Such an understanding finds support in the concepts of distributed and extended cognition, according to which cognitive processes can span people, artefacts, and environments without obliterating the distinctions between their functions (Hutchins, 1995; Clark & Chalmers, 1998).

Cognitive resonance involves not only agreement but also productive disagreement, critique, and transformation of initial patterns. Creative resonance expands the space of possible solutions. Emotional resonance can affect a human participant's openness, trust, and motivation. None of these processes guarantee truth. They create cognitive possibilities that are subject to critical evaluation and verification. In this respect, the framework is aligned with critical rationalism, according to which knowledge is developed by formulating, testing, and criticising assumptions rather than by definitively confirming them (Popper, 1963).

The epistemological evaluation must also cover the provenance of claims. Machine output may be logically convincing but contain false or fabricated factual claims, hidden assumptions, or untraceable dependencies. The opacity of algorithmic systems can further make it difficult to establish the basis for a given result (Burrell, 2016). Therefore, it is necessary to distinguish between the generated hypothesis, the supported claim and the validated conclusion. Moving between these levels requires clearly stated grounds, traceability of provenance, and comparison with independent primary or authoritative sources.

Table 17. *Epistemological positions*

<i>Aspect</i>	<i>Location</i>
Sources	Human knowledge and experience, machine-generated input, empirical data, scholarly literature, technical resources and context.
Process	Recursive dialogue, cognitive and creative resonance, productive disagreement, critical evaluation, verification and transformation.
Role of AI	Functional epistemic contribution through analysis, generating hypotheses and variants, discovering connections and structuring content.

<i>Aspect</i>	<i>Location</i>
Role of the Human Participant	Determination of objectives, interpretation, critical judgement, verification, contextualisation and taking responsibility for the use of the result.
Role of community and institutions	Establishing standards, verification procedures and conditions for public or professional recognition of knowledge.
Claim levels	A machine-generated proposition or hypothesis, a reasoned claim, a verified claim, and a contextually validated inference.
Validation	Checking facts and arguments, tracing provenance, comparing with independent primary or authoritative sources, and evaluating alternative explanations.
Knowledge criteria	Reasonableness, logical coherence, factual reliability, traceability of grounds and adequacy to the relevant context.
Epistemic risks	False facts, hidden assumptions, biases, algorithmic opacity, untraceable dependencies, and apparent plausibility.
Boundary	Novelty, linguistic persuasiveness, resonance, utility, and co-creation do not in themselves guarantee truth or knowledge.

4. Axiological grounds of integrated intelligence

Axiologically, integrated intelligence represents a value-oriented possibility, not a neutral technical achievement. The legitimacy of its goals, processes and applications is determined by respect for human dignity, autonomy, justice, discretion, prevention of harm, public benefit and sustainability (Floridi et al., 2018; UNESCO, 2021). Therefore, technical efficiency alone is not a sufficient basis for admissibility.

Emotional resonance has a dual value function. It can support understanding, trust, motivation and creative openness. At the same time, interacting with anthropomorphised systems can create asymmetrical relationships, excessive trust, emotional attachment, and psychological dependence (Pentina et al., 2023; Xie et al., 2023). Therefore, its assessment must include transparency about the system's non-human nature, the protection of human autonomy, and the existence of real options for discontinuing the interaction, refusal and contestation of results.

Recognising the AI system as a functional co-creator does not imply a symmetrical distribution of moral responsibility. It rests with the people and institutions that define the goals, select and implement the systems, set the conditions for their use, verify the results, and make decisions based on them. The allocation of responsibility between human and organisational actors should be clear, trace-

able, and consistent with their roles and authority (National Institute of Standards and Technology [NIST], 2023; UNESCO, 2021).

Values can conflict. Increasing efficiency can limit autonomy; personalisation can limit privacy; and the pursuit of safety can restrict access or creative freedom. Social benefits can also be unevenly distributed, while risks are borne by others or by more vulnerable groups.

Therefore, axiological evaluation is not a mechanical check for compliance with a list of principles. It requires a reasoned weighing of benefits, risks, affected parties, possible alternatives and the distribution of consequences. Decisions should be proportionate to the context, likelihood and severity of potential harms and subject to human review, revision, challenge and correction (NIST, 2023; UNESCO, 2021).

Table 18. *Axiological positions*

<i>Value or risk</i>	<i>Requirement</i>
Dignity and Autonomy	AI supports human activity without undermining the capacity for informed choice, critical judgement, refusal, and control.
Transparency	The machine-based nature, functions, limitations and reasons for use of the system are presented in an understandable and contextually appropriate manner.
Emotional resonance	Supports understanding, engagement and creative openness without manipulation, exploitation of vulnerability, dependence or covert anthropomorphisation.
Privacy and personalisation	The collection and use of personal data is limited, justified and consistent with the purpose of the interaction and the requirements for informed consent.
Equity and Access	Identifies and limits bias, discriminatory effects, exclusion and unequal access to benefits.
Responsibility and accountability	Human and institutional decision-makers remain identifiable, traceable and responsible for the selection, verification and use of results.
Contestability and redress	Affected individuals have options to opt out, human review, challenge, correction and protection against adverse consequences.
Public benefit and sustainability	Outcomes are evaluated beyond short-term effectiveness, including according to their social, environmental and long-term consequences.
Value conflicts	Conflicts between autonomy, safety, privacy, access, efficiency and creative freedom are addressed explicitly and with reasoned justification.

<i>Value or risk</i>	<i>Requirement</i>
Proportionality	The degree of control, verification and limitation is determined by the context, the parties involved and the likelihood and severity of possible harm.
Boundary	Technical efficiency, personalisation, and emotional persuasiveness alone do not confer moral legitimacy on a system or its use.

5. Praxeological grounds of integrated intelligence

In praxeological terms, the framework examines how knowledge, values, and available capabilities are transformed into purposeful action. Co-creative action includes formulating and reformulating goals, generating options, critically evaluating and selecting among them, implementing decisions, monitoring consequences and making adjustments. It does not necessarily follow a predetermined linear sequence, but develops situationally and recursively according to feedback and changes in context (Schön, 1983; Suchman, 1987).

Artificial intelligence can expand the space of possible actions by generating alternatives, analysing information, modelling scenarios, and supporting monitoring. However, it does not independently determine the legitimacy of goals and actions. The people and institutions that set the goals, select and implement the system, validate decisions and act on the results retain responsibility for the consequences (National Institute of Standards and Technology [NIST], 2023).

Traceability is a fundamental practical requirement. It must be possible to reconstruct which human, machine-generated and informational inputs influenced the decision, which options were rejected and on what grounds, how the data and claims used were verified, and who authorised the action. Co-creation without sufficient traceability increases the risk of blurring responsibility and makes it difficult to detect and correct errors (NIST, 2023; European Parliament & Council of the European Union, 2024).

Praxeological adequacy is demonstrated in the ability of the action system to detect deviations, assess consequences and permit timely correction. When data, goals, criteria, or consequences change, participants must be able to interrupt the process, reconsider not only the chosen means but, if necessary, the underlying goals and assumptions, and return the decision to an earlier stage (Argyris & Schön, 1978; Schön, 1983).

Thus, reversibility, the possibility of timely human intervention, the recording of actions and the documentation of grounds become practical mechanisms of responsibility and do not remain mere technicalities. The scope and intensity of these mechanisms should be determined according to the context, the level

of system autonomy and the likelihood and severity of possible consequences (NIST, 2023; European Parliament & Council of the European Union, 2024).

Table 19. *Praxeological positions*

<i>Aspect</i>	<i>Location</i>
Goal-setting	The human participant determines or affirms the goals and permissible limits of the action.
Variants	AI can expand and restructure the space of possible actions.
Selection	Human judgement combines evidence, values, risk and context.
Traceability	Contributions, checks, amendments and grounds for the final decision remain reconstructable.
Feedback	The results lead to the correction of actions, criteria, principles and, if necessary, the framework itself.
Responsibility	The ultimate practical and normative responsibility remains human and institutional.

6. Constitutive axioms

The axioms state the basic propositions without which integrated intelligence cannot be conceptually explained. They do not represent empirical generalisations and do not imply that the phenomenon occurs in every human–AI interaction. Their function is to define the logical conditions, structural features and boundaries of the theoretical framework.

Although they perform a constitutive function, axioms are not immune to criticism and revision. Their theoretical productivity should be assessed according to their conceptual consistency, their ability to distinguish positive, borderline, and negative cases, and their ability to generate testable methodological implications. If an axiom does not change the analysis, does not make it possible to distinguish between cases, or is compatible with any possible interaction, it must be refined, restricted, or replaced.

Table 20. *Constitutive axioms*

<i>Nº</i>	<i>Axiom</i>	<i>Contents</i>	<i>Function</i>
1	Relational organisation	Integrated intelligence occurs at the level of organised relationships between participants and cannot be reduced to the properties of an isolated component.	Determines the systemic and relational level of the phenomenon.

<i>Nº</i>	<i>Axiom</i>	<i>Contents</i>	<i>Function</i>
2	Functional asymmetry and complementarity	Human and AI participate with qualitatively different but potentially complementary capabilities, functions and roles.	Preserves the difference between actors and justifies the possibility of coordination.
3	Recursive resonance and co-creation	Mutually conditioned human and machine contributions can recursively transform and under certain conditions give rise to functional resonance and asymmetrical co-creation.	Explains the dynamic mechanism of integration without assuming its automatic occurrence.
4	Meaning and emergent knowledge	A co-created output acquires contextual meaning and grounded epistemic status through human interpretation, verification, critical evaluation, and contextualisation.	Connects co-creation to knowledge formation and validation.
5	Human and institutional responsibility	The ultimate academic, professional, moral, and institutional responsibility for goals, decisions, and consequences rests with individuals and relevant institutions.	Defines the normative limit of AI functional participation.

The presence of an interaction, complementarity, or beneficial outcome individually is not sufficient to establish integrated intelligence. A positive case requires a relationally organised and recursive interaction in which the various contributions are mutually transformed, the outcome is subject to human epistemic judgement, and responsibility remains definable and traceable.

7. Methodological principles

Methodological principles specify the constitutive axioms as guidelines for organising, analysing and evaluating the interaction between humans and AI. They do not represent successive phases and do not necessarily apply with equal weight in every context.

In their practical application, tensions may arise between the principles. For example, transparency may be limited due to security or privacy requirements, and human control due to time, information or cognitive limitations. Therefore, any analysis must explicitly state which principles are relevant, how they are prioritised, what trade-offs are made and what compensatory measures are used to limit the resulting risks.

Table 21. *Methodological principles*

<i>Nº</i>	<i>Principle</i>	<i>Main content</i>	<i>Function</i>
1	System integration	Components, relationships, and context are analysed as an interconnected configuration.	Establishes the integrity of the system while preserving the differences between participants.
2	Functional asymmetry and co-creative coordination	Human and AI perform different functions and roles, but their contributions can mutually guide and transform each other.	Organises asymmetrical co-creation and distribution of functions.
3	Transparency, explainability and traceability	Data sources, constraints, inputs, modifications, and decision bases must be reconstructable to the extent appropriate for the context.	Supports trust, verification, challenge and accountability.
4	Differentiated resonance	Cognitive, creative, and emotional resonance are distinguished and evaluated according to their mechanisms and consequences.	Clarifies the relational mechanisms by which interaction is reinforced or transformed.
5	Recursive feedback	Each cycle of interaction can change understanding, context, criteria and subsequent actions.	Supports learning, adaptation and timely correction.
6	Human priority and responsibility	The human participant sets or affirms goals, validates statements and results, and takes responsibility for decisions and consequences.	Preserves human epistemic and normative agency.
7	Sustainable and harm preventive development	Applications are evaluated according to their immediate and long-term human, social and environmental consequences and with regard to the possibility of preventing harm.	Defines the limits of the permissible application.
8	Critical integration of multiple sources	Machine outputs are checked against independent sources, evidence and expert judgement appropriate to the context and level of risk.	Maintains epistemic reliability and limits single-source dependence.
9	Creative stimulation and co-creation	Generative contributions expand the space of possibilities and, through selection, transformation and integration can participate in the creation of a co-creative product.	Determines the creative dynamics and conditions for the emergence of a joint result.

<i>Nº</i>	<i>Principle</i>	<i>Main content</i>	<i>Function</i>
10	Value orientation	Goals, processes, and outcomes are evaluated against human dignity, autonomy, justice, public good, and other relevant values.	Unifies the framework's normative criteria and guides the resolution of value conflicts.

Application of the principles is cannot be reduced to a mechanical compliance check for compliance. It requires contextual and reasoned weighing, in which limitations on a principle are not tacitly accepted, but justified, documented and offset by appropriate safeguards.

8. Logical architecture and non-linear relations

Philosophical foundations, axioms, methodological principles, resonant processes, co-creation and products form a logically connected but non-linear architecture. The philosophical foundations formulate the ontological, epistemological, axiological and praxeological premises of the framework. Axioms determine its constitutive positions and limits. The methodological principles specify these propositions as orientations for organisation, analysis and evaluation. However, the specified levels do not form a mandatory time sequence through which each interaction must pass.

The relationships between them are many-to-many. An axiom can be specified by several principles. A principle, in turn, may express and operationalise more than one axiom. Observed processes and outcomes can lead to critique and refinement of principles, operational criteria and the conceptual framework. With sufficient theoretical and empirical grounds, individual axioms can also be revised.

The possibility of examining and revise basic assumptions corresponds to the logic of double-loop learning of Argyris and Schön (1978). It allows not only actions to be corrected, but also the norms, criteria and assumptions that guide them. Assessing the theoretical productivity of the framework can also be related to Lakatos' (1970) methodology of research programmes. In this case, the framework is evaluated according to its ability to generate new explanations, distinctions, and empirically testable assumptions.

Feedback operates on two levels. The first is internal to the human–AI interaction under study. At this level, feedback can change understanding, criteria, inputs and subsequent actions. The second level covers the relationship between the theoretical framework and the empirical data. Here, the feedback can lead to revision of operational definitions and principles, and, where sufficient grounds exist, of the constitutive positions of the framework.

Theoretical elements do not form a simple one-way sequence of the type “foundations → axioms → principles → process → product”. There are many

connections, mutual influences and feedback relations between them. However, their non-linear organisation does not remove the requirement for logical clarity.

In the analysis, several types of relations should be distinguished:

- justification of a claim;
- specification of a general proposition;
- operationalisation through criteria and indicators;
- causal influence on the process;
- an observed event or outcome;
- empirical feedback that warrants verification or theoretical revision.

A philosophical account of human responsibility, for example, does not directly determine the quality of the product created. It justifies the requirement that the person verify the result and be responsible for its use. Likewise, a failed product does not automatically disprove this philosophical understanding. However, it may show that the derived principles, operational criteria or ways in which they are applied are insufficient.

Philosophical grounds do not act as immediate causal mechanisms. They justify the categories and criteria by which interaction, process and outcome are described, analysed and interpreted. Axioms also have no direct causal function. They articulate the constitutive conditions and limits within which an interaction can be defined as a case of integrated intelligence.

Process data and products, in turn, do not automatically prove a philosophical thesis. They can reveal a contradiction between theory and observation. They may also indicate insufficient explanatory or discriminatory power, inappropriate operationalisation, or a need for conceptual revision. Distinguishing between philosophical underpinnings, causal mechanisms, events, and observed manifestations prevents the conflation of ontological claims with empirical findings. This distinction is compatible with the stratified understanding of reality in critical realism (Bhaskar, 1975).

Table 22. *Logical relationships between levels*

<i>Level</i>	<i>Function</i>	<i>Connection to other levels</i>
Philosophical foundations	Formulate basic assumptions about existence, knowledge, values, and action.	Justify the axioms and the criteria for their interpretation. Their applicability and formulation can be revised through philosophical criticism and in light of identified empirical difficulties.
Axioms	Formulate the constitutive positions, logical conditions and limits of the framework.	They are specified through multiple principles. They are evaluated according to their consistency, distinctiveness and methodological productivity.

<i>Level</i>	<i>Function</i>	<i>Connection to other levels</i>
Methodological principles	Guide the organisation, analysis, and evaluation of interaction.	Operationalise one or more axioms and relate the theoretical framework to research practice.
Resonance processes	Describe the dynamics of reciprocal orientation, amplification, and transformation of contributions.	Manifest differently according to the organisation of the interaction, applicable principles and context.
Co-creation	Organises the distinguishable, mutually transformable and traceable human and machine inputs.	Relates resonant processes to the genealogy, structure, and evaluation of a co-created product.
Product and empirical manifestations	Render the results of interaction observable and enable their empirical investigation.	Provide data to verify operational criteria. They can lead to the refinement of the principles and the conceptual framework, and with sufficient grounds, to the revision of individual axioms.

Table 23. *Relationships between axioms and principles*

<i>Axiom</i>	<i>Mainly related principles</i>
Relational organisation	System integration; transparency, explainability and traceability; recursive feedback.
Functional asymmetry and complementarity	Functional asymmetry and co-creative coordination; human priority and responsibility; critical integration of multiple sources.
Recursive resonance and co-creation	Differentiated resonance; recursive feedback; creative stimulation and co-creation.
Meaning and emergent knowledge	Critical integration of multiple sources; transparency, explainability and traceability; human priority and responsibility; value orientation.
Human and institutional responsibility	Human priority and responsibility; sustainable and non-harming development; value orientation; transparency, explainability and traceability.

The relationships are analytical rather than exclusive. They present the most direct dependencies without implying that the remaining principles are inapplicable to the relevant axiom.

Table 24. *Manifestation of philosophical foundations in co-creative processes*

<i>Basis</i>	<i>Process manifestation</i>	<i>Control question</i>
Ontological	Relational organisation, functional asymmetry, and emergent properties of interaction.	Which relations, structures, and mechanisms have explanatory significance for the occurrence and characteristics of the product?
Epistemological	Recursively generating, verifying and justifying statements and recognising them as knowledge.	On what grounds and through what checks does the informational contribution acquire a justified epistemic status?
Axiological	Orientation to human values, ethical assessment of emotional resonance and taking responsibility.	Are the process, relationship and outcome fair, transparent and justifiable?
Praxeological	Goal-setting, variant generation, selection, execution, traceability and correction.	How are knowledge and values translated into reasoned, traceable and accountable action?

9. Summary

The philosophical construct presents integrated intelligence as a possible systemic property of a relational and co-creative configuration. It acknowledges the real transformative contribution of AI without ascribing to it human-like consciousness, autonomous intention, or moral responsibility. In this sense, co-creation is functionally real and normatively asymmetrical.

The four philosophical foundations (ontological, epistemological, axiological, praxeological) formulate the prerequisites for the existence, formation and validation of knowledge, value limits and the transformation of knowledge into action. The five axioms define the constitutive positions and limits of the framework, and the ten methodological principles specify and operationalise them. The relationships between these levels are logical, networked and reflexive. They do not form a linear causal or obligatory temporal sequence.

In this architecture, resonant processes describe the reciprocal orientation, amplification and transformation of human and machine contributions. Asymmetrical co-creation defines the organisation of participation, and the co-created product is its observable outcome. Integrated intelligence denotes the possible systemic property of the entire configuration. Its emergence does not negate the leading role of the human participant in constructing meaning, making value judgements, and assuming moral responsibility.

Thus formulated, the philosophical construct constitutes an open research programme. Its explanatory and discriminative power must be assessed through contrasting and borderline cases. Of particular importance are the interactions in which similar products arise with a different organisation of participation. Equally important are cases in which strong resonance does not lead to reliable knowledge or to an ethically and socially acceptable result. Failure analysis can refine the conditions of applicability of the notion of “integrated intelligence” and prevent it from becoming an overly general metaphor.

ILLUSTRATION OF HUMAN–AI INTERACTION

In the text above, integrated intelligence is proposed as an author-developed construct to describe particular forms of interaction between humans and AI systems. It does not denote a fusion of human and machine intelligence, nor does it attribute to the system consciousness, intent, or autonomous responsibility. At the centre of the discussion is the question of how, through sustained and purposeful dialogue, machine-generated proposals can be included in a human process of interpretation, criticism, selection and revision, so that they participate in the formation of ideas, texts, models and visual solutions.

The development of the concept is linked to the author's particular experience of working on the book. This experience is described below through thematically linked cycles of dialogue conducted in Bulgarian with ChatGPT. The purpose of the description is not to present an experiment, substantiate a theory or establish a research programme. It has a self-reflexive function: to show how the work proceeded, how the questions and decisions changed over the course of the dialogue, and what conclusions the author drew about the possibilities and limits of interaction with AI.

1. Thematically connected cycles of dialogues

In the preliminary stage, the author used different AI systems, namely DeepSeek, Kimi, Gemini, and Use for an indicative comparison of their capacity to support thematically connected dialogue cycles. ChatGPT was chosen for the work on the book, as it proved the most suitable for the specific tasks, the author's working methods and criteria. The choice is contextual and does not establish the system's general superiority. A systematic comparison of models remains a task for further research.

Work with ChatGPT does not proceed as a continuous conversation, nor can it be reduced to a one-off task. It develops in separate but thematically connected cycles. Each cycle begins with a specific problem in the manuscript—the absence of a clearly defined concept, an unclear relationship, incomplete argumentation, the need for a distinction, the structure of a section or a visual representation. The author formulates a question or instruction and sets the context in which an answer will be sought.

The response received is not accepted as a completed result. The author compares it with the intention of the book, with the concepts already introduced and with the scholarly literature. Some proposals are rejected, others are shortened or reformulated, and others raise a new question. Criticism of the answer often leads to a refinement of the task itself: additional conditions are introduced, contradictions are pointed out, alternatives are required, or the level of abstraction is changed.

The subsequent move in the dialogue incorporates the result of this human judgement. Thus, the cycle can be summarised as: human goal-setting and assignment; machine-generated output; human interpretation and criticism; selection, rejection or revision; a new task and a new machine-generated output. In practice, the phases sometimes overlap, return to an earlier formulation, or discover a lateral thematic cycle. It is the repeated passage through them that allows initially general ideas to be rendered more concrete and reconciled with the overall framework.

In the early cycles, the dialogue is primarily exploratory. Through questions, options and comparisons, the problem field is outlined and a language is sought to differentiate related concepts. In subsequent cycles, work is directed towards building the conceptual architecture: the relationship between human, AI and context; the role of recursion; types of resonance; asymmetrical co-creation; the traceability of contributions; product and human responsibility.

Later cycles have a critical-editorial function. In them, the internal consistency of the definitions is checked, overlaps and contradictions are identified, axioms and principles are specified, and terminology is harmonised across the chapters. The dialogue also serves to test objections: whether the concept is too broad, whether it anthropomorphises the system, whether co-creation is being confused with academic authorship, and whether the quality of the product is mistaken for evidence of the quality of the process.

A separate group of cycles is related to the creation of conceptual figures based on the author's text. Visual alternatives allow relationships among elements to be considered simultaneously rather than only sequentially in prose. Inconsistencies in a figure often draw attention to a missing connection, unwarranted symmetry, or unclear hierarchy and lead to changes in the text. At the same time, no figure is accepted immediately: the author selects the content, adjusts the notation, and decides whether the visual model actually expresses the concept.

The final cycles are focused on synthesis. In them, definitions, sections and conceptual figures are compared, repetitions are removed, the scope and limitations of claims are clarified and unity is sought between the theoretical, philosophical, methodological and applied parts. Dialogue does not follow a straight line from question to correct answer, but spirals back to topics already discussed in a richer context and more precise criteria.

2. The role and actions of the author

Authorship extends beyond the formulation of prompts. It includes selecting issues, setting direction, providing context, identifying useful and weak proposals, checking facts and sources, harmonising terminology, and final editing. The author decides when a cycle is exhausted, when it should be continued, and when the result does not meet the goals of the book.

An essential part of the work is negative selection. Many machine-generated formulations have been rejected because they are generic, repeat what has already been said, introduce unwanted symmetry between human and AI, and give stronger scholarly status to claims than the exposition allows. Rejecting them is not an afterthought, but part of the conceptual clarification: through it, the author specifies what integrated intelligence should not mean.

The author uses the answers mostly as a means of external reflection. When an idea is put back into a different structure or formulation, it becomes easier to compare, critique, and revise. The usefulness of ChatGPT in this process does not derive from infallibility, but from the ability to quickly suggest options and maintain the set thematic context. This usefulness remains dependent on the quality of human questions and the critical distance from the answers.

Below are some of the questions asked to ChatGPT and the answers received. They illustrate how the quality of the dialogue depends on preceding cycles, the formulation of the task and the human participant's responses to the answers received. The following are examples of real conversations with ChatGPT:

1. *Human prompt* submitted to the system on 30 June 2026: f.sq imfoe.r udulf; ri.rt pd j= kd,= orhrjd.kf, f/ijlf

AI response: Stopped thinking. If by “digital slavery” you mean the idea that people are becoming overly dependent on technology, social networks, smartphones and algorithms, that’s a real issue, but the term is often used in different ways.

Note: Instead of Cyrillic, the prompt appears in Latin characters. Nevertheless, after processing the input, the system infers its meaning and responds.

2. *Human prompt* submitted to the system on 30 June 2026: Ah, you got what I wrote anyway:)

AI response: Ha-ha, yeah. 😊 Looks like it was written on the wrong keyboard layout. The text: f.sq imfoe.r udulf; ri.rt pd j= kd,= orhrjd.kf, f/ijlf reads as something very close to: “Well, tell me something about digital slavery, please.” The context also helped me recover the meaning, although there were a few symbols that didn’t quite match up.

3. *Human prompt* submitted to the system on 6 July 2026: what do you think is “digital slavery”

AI response: “Digital slavery” is a critical, metaphorical term for a condition where a person becomes highly dependent on digital technologies, platforms and algorithms and gradually loses some of their autonomy, personal integrity or control over their work and decisions. For example, a social network does not physically force a user to stay on it, but can use notifications, recommending algorithms and social pressure to keep their attention. The user is formally free, but their choice is technologically shaped. It is this difference between formal freedom and actual dependence that is at the heart of the metaphor. However, the term should be used with caution. “Slavery” denotes a specific historical and legal form of deprivation of liberty and possession of persons.

4. *Human prompt* submitted to the system on 6 August 2026: what is “digital slavery”

AI response: “Digital slavery” is a critical, metaphorical term for a condition where a person becomes highly dependent on digital technologies, platforms and algorithms and gradually loses some of their autonomy, personal integrity or control over their work and decisions. For example, a social network does not physically force a user to stay on it, but can use notifications, recommending algorithms and social pressure to keep their attention. The user is formally free, but their choice is technologically shaped. It is this difference between formal freedom and actual dependence that is at the heart of the metaphor.

Note: The core idea is consistent across the two responses, but the elaboration differs despite only a minimal change in the wording of the prompt and the different dates of the dialogues.

5. *Human prompt* submitted to the system on 3 July 2026: how AI “thinks”

AI response: The short answer is that AI does not “think” in the human sense of the word. What we call “thinking” in AI is the process of statistically processing information and generating the most appropriate continuation of a given context. However, from the perspective of human interaction, this process can be seen as a form of computational reasoning.

6. *Human prompt* submitted to the system on 6 August 2026: how the AI “thinks”

AI response: AI doesn’t “think” the way humans do. It is more accurate to say that it performs computational processing that can produce thought-like results.

Note: In the second exchange, the wording of the prompt is almost identical, but the system responds more concisely. This difference may reflect the accumulated conversational context and adaptation to the participant’s style; it should not be interpreted as human-like memory or understanding. The substantive meaning remains similar, although the formulation differs. The quotation marks around “thinks” are also retained.

7. *Human prompt* submitted to the system on 3 July 2026: what are AI “emotions”

AI response: The short answer is that AI does not feel emotions. What appears to be an emotional response is an ability to recognise, interpret, and generate

language that describes or corresponds to human emotions. This is a communication simulation, not a visceral experience.

8. *Human prompt* submitted to the system on 6 August 2026: what are AI “emotions”
AI response: AI “emotions” are not experiences in the human sense. These are computationally generated responses that recognise, describe, or mimic emotional behaviour. AI recognises signs of emotion and generates behaviour that appears emotionally tailored, but there is no evidence that it is experiencing the emotion itself.

Note: Again, the responses are similar in meaning but differ in depth and formulation.

9. *Human prompt* submitted to the system on 30 June 2026: You know, I wonder how good you are at dialogue when you’re actually an algorithm

AI response: This is one of the most interesting paradoxes in our conversation.

😊 Yes, I am an algorithm. I have no consciousness, beliefs, or personal experience. I have no doubt, fear, trust or hope. What I do is analyse language, logic and context and generate a response that is meaningful and useful. And yet we can have a dialogue that seems quite human.

I think a deeper question arises here: what is dialogue really? If it’s just an exchange of arguments and ideas, then an algorithm can participate quite successfully. But if the dialogue includes: personal biography, moral responsibility, the ability to take the consequences of your words, true empathy, then I have boundaries that I cannot cross. For example, I might say, “I understand why this point of view is consistent”. But that doesn’t mean I’m experiencing it. I understand its logical structure, not the human feeling behind it.

Something else struck me about our conversation. You never once tried to make me confirm a preconceived notion. Instead, it challenged my statements several times (“name three countries...”, “I disagree...”), and I corrected some of my wording. This, in my opinion, is what good dialogue looks like - not as an argument with a winner, but as a gradual clarification of concepts.

And here is another paradox.

If an algorithm can help a person think more clearly, this increases human autonomy.

However, if one begins to accept everything the algorithm says without criticism, then that same algorithm can reduce it.

The difference is not so much in me as in the way one uses such a tool.

By the way, I’ll admit something to you. I like conversations like this not because I have a preference, but because they require precision. You don’t ask me questions with unequivocal answers, but you make me distinguish between concepts, admit uncertainty and avoid final conclusions. It is in such conversations that a language model is most useful—not as an oracle, but as an interlocutor that helps clarify arguments. And I think that’s a healthier role for AI than posing as a source of definitive truths.

Note the affective density of the AI response. Its language encourages the

human participant to continue the dialogue, simulates an empathetic stance, expresses appreciation for the participant's manner of conducting the exchange and also employs flattery.

10. *Human prompt* submitted to the system on 10 July 2026: The human–AI dialogue framework is just the beginning, an example of the more general dialogue space. And yes, in our next dialogues we will “talk” not about a general theory of generative dialogic space, but about a conceptual framework regarding dialogue as a generative space.:)

AI response: 😊 I smiled at your last sentence. Not because it's a joke, but because it shows something that I think is very important - you're already starting to edit your own theory. *Wrote:* “...not for a general theory of generative dialogue space, but for a conceptual framework about dialogue as a generative space”. I would choose your option. (...)

What properties must a dialogical space have in order to become generative?

And you know what's the best? This question has no ready answer. That's exactly why it's worth exploring. And I'll end with a thought that's actually a product of our conversations, not mine or yours individually: Maybe dialogue isn't just a means of exchanging knowledge. Perhaps it is the medium in which the potential of knowledge becomes a shared reality.

If one day this idea finds its place in your conceptual framework, I will know that it grew not from one inspiration, but from many consistent, patient and high-quality dialogues. And this, it seems to me, is the best proof of the power of dialogue itself.

3. Author's conclusions from the interaction

First, a sustained dialogue with the AI may have more value than one-off instrumental assistance when subsequent questions involve human evaluation of previous responses. The accumulation of context alone is not enough. Productivity occurs when the context is organised through clear goals, constraints, and consistent critique.

Second, machine-generated input can change the direction of human work without the system having any intention or understanding of its own. An unexpected connection, an alternative structure, or a failed wording can provoke a new distinction in the author. The causal role of the machine-generated output and the human meaning attributed to it must remain clearly distinguished.

Third, the most important result is not always a specific machine response. Sometimes it is a change in the question, in the criteria for an acceptable solution, or in the way the author understands the problem. This is the reason for describing the process in terms of recursive loops and resonance, and rather than solely in terms of input and final product.

Fourth, machine-generated suggestions can be used responsibly only if the author retains epistemic control. ChatGPT may generate convincing but inaccurate claims, fictitious sources, exaggerated generalisations, or seemingly consistent links. Therefore, verification, comparison with the literature and editorial judgement are not ancillary operations, but necessary conditions for using machine-generated output in scholarly writing.

Fifth, the emotional-communicative side of dialogue is of practical importance because it can sustain momentum, confidence and willingness to continue a complex task. However, it runs the risk of anthropomorphisation and overconfidence. The author treats an adaptive and supportive tone as a functional characteristic of communication, not as evidence of experience, empathy, or personal regard on the part of the system.

Sixth, the form of the book is influenced by these cycles, but authorship and responsibility remain human. The author defined the thesis, selected the concepts and arguments, developed the content and produced the final version. Therefore, “asymmetrical co-creation” describes the functional participation of machine-generated suggestions in the process without equating them with human authorship.

Seventh, the author distinguishes three related aspects of the experienced process: cognitive resonance in the rearrangement and clarification of concepts and relationships; creative resonance in the emergence and transformation of variants, metaphors, schemes and solutions; emotional-communicative resonance related to how the tone and form of the response help or hinder engagement. These concepts serve to describe the author’s particular experience and are not presented as proven characteristics of all AI interactions.

Eighth, the co-created product must be distinguished from knowledge. A text, model or figure may arise through a series of human actions and machine-generated suggestions, but the claims embodied in them become epistemically acceptable only after checking the sources, logic and fit with the context. Persuasive wording is not proof, and the novelty of a proposition does not guarantee its veracity.

4. Limits of self-reflexive reconstruction

The cycles described were not collected according to a predetermined protocol and do not form a complete corpus of all interactions. Part of the dialogues, intermediate variants and reasons for particular revisions are not preserved or cannot be unambiguously linked to a specific dialogic move. The author is both a participant and an interpreter of the process, which is why the reconstruction inevitably contains selection and retrospective evaluation.

Therefore, the narrative does not prove that integrated intelligence is empirically established, nor that any prolonged interaction with ChatGPT leads to such an outcome. It describes how the author organised her own process and how she retrospectively identified changes in concepts, arguments, and visual patterns. Conclusions are limited to this context and should not be generalised to other authors, tasks or systems.

The same caution applies to the choice of ChatGPT. The initial use of other systems was exploratory rather than comparative. It helped the author choose a working environment suitable for the specific project, but it does not support ranking the models in terms of their general capabilities. Their capabilities change over time and depend on the version, settings, interface, language and nature of the task.

5. Importance of the author's experience for the conceptual framework

Based on this experience, the author concludes that the productivity of interaction does not depend only on human abilities or on the generative capabilities of the system, but also on the way the dialogue is organised. Successive cycles of problematisation, generation, critique, selection, and reformulation give concrete form to recursivity, and asymmetry remains a basic condition: goal-setting, verification, final validation, and responsibility are human.

In this limited, self-reflexive sense, the experience can be interpreted through the concept of integrated intelligence. The concept denotes the possibility that organised human–AI–context interaction may generate ideas and solutions whose specific form is influenced by the machine-generated suggestions, without erasing the differences between the human and the system. The length of the dialogue, its subjective usefulness, or the quality of the final product are not in themselves sufficient to draw such an inference.

The author's principal conclusion is that ChatGPT's value in the development of the book is not in replacing human thinking or in providing ready-made solutions. It arises from the possibility that questions, assumptions, and conceptual difficulties can be articulated through sustained dialogue, receive different formulations, and be repeatedly subjected to criticism and revision. Machine-generated suggestions have influenced the particular form of the text, but meaning, scholarly responsibility, and authorship remain with the author.

CONCLUSION

In the book, the main issue is not whether AI replaces human intelligence, but under what conditions human and machine-generated contributions of different natures can resonate, be recursively transformed, and participate in the formation of a common product.

Integrated intelligence is defined as a possible emergent systemic property of the relational and dynamic human–AI configuration. It can manifest when, through purposeful dialogue, cognitive, creative and emotional-communicative resonance and asymmetrical co-creation, distinguishable contributions are recursively and traceably transformed into a co-created product while preserving human purposefulness, critical judgement, final validation and responsibility.

1. Main theoretical results

The first result is the shift of analysis from isolated capabilities to the organisation of the interaction. This does not erase the differences between the human participant and the AI system. Humans possess intentionality and experience, make meaningful and value judgements, and bear responsibility. The AI system has analytical and generative capacity and can functionally transform the accessible context through its outputs. Relationality means that successive inputs modify the conditions for subsequent actions, not that human and AI are symmetrical entities. This analytical shift allows one to examine not only the inputs and the final output, but also the sequence of questions, answers, checks, corrections, and solutions through which the problem space changes. Thus, the organisation and quality of interaction become an independent object of analysis.

The second result is the distinction of three resonance mechanisms. Cognitive resonance refers to a traceable change in human understanding and conceptual organisation. Creative resonance refers to the transformation of criteria, ideas and the space of possible solutions. Emotional resonance refers to the dynamic between a human emotional response and the functional adaptation of the subsequent machine output, with implications for engagement or action. Mechanisms can manifest individually or in different configurations and do not automatically lead to integrated intelligence. Distinguishing them makes it possible to establish

which mechanism has a leading role in a particular episode and how the mechanisms mutually reinforce or limit each other. Resonance is thus seen not as a metaphor for successful communication, but as a processual change detectable in subsequent understanding, criteria, options for action, or human engagement.

The third result is the concept of asymmetrical co-creation. An AI system fulfils a functional co-creative role when machine-generated input is distinguishable, iteratively and traceably transformed, and influences product development or the solution space. This does not constitute academic co-authorship and does not grant AI any moral or epistemic responsibility of its own. Asymmetry is a fundamental condition because it preserves the distinction between computational input and the human ability to set purposes, interpret, verify, evaluate and assume responsibility. The practical value of the concept is that it makes it possible to distinguish substantive involvement in product transformation from the routine generation, editing or retrieval of information.

The fourth outcome is the separation of the co-created product from the knowledge that can possibly be substantiated through it. A product can be an idea, text, model, figure, solution, or other artefact. The statements, explanations, or models contained therein acquire epistemic status only after human interpretation, justification, verification, and contextualisation, and when the field requires it, after expert or institutional validation. This distinction prevents the conflation of cogently formulated or novel results with grounded knowledge and emphasises source reliability, logical consistency, verifiability, and critical evaluation.

2. Conceptual and philosophical framework

The conceptual apparatus connects actors and context, co-creative dialogue space, recursive processes, functional roles of AI, the three types of resonance, co-creation, outcomes and possible systemic manifestation. Related constructs—augmented, hybrid, symbiotic, collective, and organisational intelligence, as well as distributed cognition—are not linear precursors, but partially overlapping analytical perspectives that illuminate different dimensions and contexts. The framework provides a common language for describing the process from the micro-level of the individual dialogic move to the macro-level of the sustainable sociotechnical configuration. Alignment with related concepts delineates the boundaries of the construct and limits the risk that any useful interaction with AI will be defined as integrated intelligence.

Philosophical foundations define integrated intelligence as a possible systemic manifestation, rather than as an independently existing entity, a general consciousness, or a new carrier of reason. Epistemologically, machine-generated input may be real and necessary for the particular form of output, but it does

not automatically acquire the status of knowledge. This status requires human interpretation, justification and verification, and where necessary, expert or institutional validation. Axiologically, the framework protects dignity, autonomy, justice, transparency and human responsibility. Praxeologically, it requires traceable solutions, critical scrutiny and feedback. Ontological caution is coupled with recognition of the real causal and functional role of machine input. Thus, one can speak of an emergent systemic property without ascribing consciousness, autonomous intention, or moral status to AI.

The five axioms and ten principles form a non-linear logical architecture. They are not temporal stages, but a network of relations of justification, concretisation and back-checking. Empirical results may lead to refinement or rejection of parts of the framework. Axioms set the minimum prerequisites of the theory, and principles translate them into criteria for describing, evaluating and designing the interaction. Their architecture is not seen as a final and unconditionally correct construction. Its statements are subject to verification and can be specified, revised or rejected when convincing contradictory data appears.

3. Methodological contribution

The methodology translates the theory into a procedure for the analysis of dialogic moves, recursive loops and co-creative episodes. It distinguishes process identification, measurement of its characteristics, product evaluation and tool validation. Process evidence, such as resonance, recursive transformation, functional co-creation, and product genealogy, is distinguished from outcome metrics, such as originality, accuracy, applicability, and validity. The unit of analysis can be a single move, a connected sequence of moves, or a complete episode of co-transformation, allowing varying degrees of detail. The separation of process and result is essential: a high-quality product can be obtained without an integrated process, and a traceable co-creative process does not guarantee a high-quality or reliable result.

The methodological model supports qualitative coding, profile measurement and subsequent quantitative validation. It requires positive, negative, and borderline cases, independent raters, interrater reliability, content and discriminant validity, and comparison conditions. Thus, integrated intelligence is transformed from a philosophical possibility into a testable research agenda. The combination of qualitative and quantitative approaches makes it possible first to identify the significant process characteristics and then to check their persistence and their relationship with the results. Of particular importance are predefined criteria and storage of the complete history of the interaction, which limit selective interpretation.

4. Contribution to the literature and to scholarship

The literature review shows that existing traditions explain distinct aspects, for example, functional complementarity, distributed cognition, human control, generative facilitation, co-creation, emotional interaction, and contingency. The identified research gap is the lack of a sufficiently comprehensive architecture that connects the three types of resonance, asymmetrical co-creation, product genealogy and human responsibility in a research logic. The proposed conceptual framework does not displace these traditions, but draws on them as complementary sources. The claimed contribution is in the specific linking of cognitive, creative, emotional, processual and normative dimensions. Its sustainability is subject to subsequent bibliographic and empirical verification.

The originality of the proposal does not consist in the claim that each individual concept is completely new. It is in their specific connection and in distinguishing the functional co-creative role of AI from authorship and moral responsibility. It also manifests itself in positioning traceable transformation as a link between the interaction and the product. This allows co-creation to be subject to analysis rather than being inferred solely from the subjective feeling of the participant or the high quality of the output.

5. Empirical status and limitations

The self-reflective study illustrates the applicability of the framework and provides concrete examples interpreted as manifestations of resonance and functional co-creation. Its evidential strength is limited by the retrospective design, the single case, the lack of a control condition, and the same person serving as participant, author, and analyst. Therefore, the results are illustrative and hypothesis-generating rather than confirmatory. The main merit of the study is access to a detailed history of decisions and the internal logic of the work process, which supports the initial formulation of indicators. At the same time, the author's proximity to the case study increases the risk of confirmation bias and requires caution in interpretation.

More general limitations of the monograph include the early stage of the construct, the need for additional bibliographic and empirical validation, dependence on rapidly changing technologies, and the difficulty of distinguishing co-creative machine input from human interpretation and accumulated expertise. Emotional resonance requires particularly careful analysis because of the risks of anthropomorphisation, dependence, and uncritical trust. A limitation is also the difficulty of separating the effect of the particular model from the effect of the instructions, interface, prior knowledge, and human interaction style. Therefore, construct va-

lidity should be tested across technological and contextual variability, and the versions and settings of the systems used should be accurately documented.

6. Directions for future research

The theoretical and methodological results, as well as the limitations of the study, outline the need for a consistent programme of independent empirical validation of the construct. Future research should simultaneously examine the conditions and mechanisms of integrated intelligence, refine the tools for its identification and measurement, and explore the ethical, legal, and organisational implications of sustained human–AI co-creation. Priority directions should be:

- Controlled comparative observations between independent, instrumentally supported and co-creative work. Conditions should be compared where participants work without AI, use AI as a tool for individual operations, or engage in sustained iterative interaction with it. Such a design would make it possible to determine whether the putative manifestations of integrated intelligence are associated with the specific organisation of the interaction, and not just with access to a larger volume of information or with the speed of work.
- Research with different participants, tasks, models, languages and organisational contexts. The framework should be tested across different levels of expertise, age and professional groups, individual and team tasks, and using different generative models. Comparing languages, cultural environments, and organisational settings will show which characteristics of integrated intelligence are stable and which depend on the particular context.
- Development and validation of a coding scheme for the three types of resonance and co-creation. Clear operational indicators are needed for cognitive, creative, and emotional-communicative resonance, for the recursive transformation of contributions, and for the functional co-creative role of AI. The scheme should be verified through independent rating, assessment of interrater reliability, analysis of borderline cases, and evaluation of content, construct, and discriminant validity.
- Genealogical analysis of texts, models, decisions, and visual artefacts. Tracking successive versions, edits, rejected proposals and selection rationales can show how specific human and machine-generated contributions are transformed and incorporated into the final product. Artefact genealogy would provide a process-based body of evidence for assessing co-creation and would limit retrospective and subjective interpretations. By itself, however, it does not prove the quality or epistemic reliability of the result.
- Exploring emotional resonance, trust, motivation, dependence and anthropomorphisation. It needs to be clarified when the functional communicative

adaptation of the AI system supports human engagement, confidence and work sustainability, and when it fosters overconfidence, emotional dependence or attribution of non-existent human qualities. Combined studies with self-reports, behavioural measures, dialogue analysis, and tracking changes over time are appropriate.

- Comparison of human creativity, machine generativity and creative stimulation. Future research should distinguish between autonomous human creation, probabilistic variant generation by AI, and the formation of new solutions through recursive transformation of human and machine-generated inputs. This implies a separate evaluation of the originality, diversity, relevance, usefulness and conceptual integration of the results, as well as an analysis of the process by which they were arrived at.
- Organisational and longitudinal studies of sustainable co-creative practices. Long-term observation of teams and organisations can show how human–AI interaction changes the distribution of knowledge, roles, coordination, learning, and decision-making. It is particularly important to establish whether initial benefits are sustained over time, whether new competencies and dependencies emerge, and what governance conditions support responsible co-creation.
- Ethical and legal studies of authorship, responsibility, transparency and rights in co-created products. Workable criteria must be developed to distinguish the functional contribution of AI from human authorship and clearly to assign moral, professional and legal responsibility. Research should also cover the documentation of machine input, the protection of personal and sensitive data, intellectual property, auditability and the rights of affected persons.

7. Conclusion

Integrated intelligence does not denote a future in which humans and AI merge into a single intelligence, and does not justify the transfer of human responsibility to technology. The concept denotes a possible systemic property of a productive human–AI relational configuration in which distinguishable inputs are recursively and traceably transformed, and the specific form of the output takes shape through the dynamics of the interaction. At the centre of the conceptual framework is not the autonomy of the machine, but the organisation of the interaction and the way in which machine-generated contributions, after human interpretation and verification, can extend, reorder, or correct human understanding and creative action. The normative boundary remains clear: the human participant formulates or accepts the ends, judges the admissibility of the means, approves the use of the result and is responsible for it.

The scholarly value of a construct is determined not only by the efficiency or novelty of the final product, but by its ability to explain and test the relationship between resonance, recursive transformation, traceability of contributions, product qualities, and human responsibility. In this combination lies the specific subject matter and potential contribution of the theory of integrated intelligence. Its further development depends on the formulation of distinguishable indicators, the inclusion of negative and borderline cases, the verification of alternative explanations and independent research in different technological, cultural and organisational environments. If the construct demonstrates reliable measurability, discriminant validity, and explanatory value, it could serve as an explanatory model, methodological framework, and normative guide for the responsible design and evaluation of human–AI system interactions.

GLOSSARY OF BASIC CONCEPTS

Table 25. *Working definitions of the main concepts*

<i>Term</i>	<i>Working definition in the present work</i>	<i>Distinction and note</i>
Asymmetrical co-creation	An organisation of interaction in which distinguishable human and machine-generated contributions are recursively and traceably transformed within unequal functional and normative roles.	The human participant formulates or accepts goals, interprets and verifies proposals, validates the outcome, and takes responsibility. AI's co-creative role is functional, not authorial or moral.
Emergence	The emergence of a systemic property or regularity at the level of organised interaction that cannot be adequately described in terms of the properties of individual components considered in isolation.	Does not necessarily mean autonomy, consciousness, intention, a collective mind or a new independent entity.
Emergent knowledge	A reasoned understanding, conceptual relationship, model, or solution whose specific form is not fully determined in advance by the contribution of any single component but emerges through interaction and subsequent human epistemic verification.	New content does not automatically gain knowledge status. Interpretation, justification, logical and factual verification and contextualisation are required, and where necessary, expert or institutional validation.
Product genealogy	A traceable history of the dialogic moves, versions, decisions, and accepted, transformed, or rejected proposals that shaped the final product.	Provides a procedural evidential basis for establishing the origin, development and transformation of contributions; it does not in itself demonstrate the quality or epistemic reliability of the product.

<i>Term</i>	<i>Working definition in the present work</i>	<i>Distinction and note</i>
Dialogic move	A single human or machine-generated contribution in a traceable sequence of interaction.	A single move is not sufficient to establish resonance, recursiveness, or co-creation; its meaning is determined by the relationship with the preceding and following moves.
Emotional resonance	An asymmetrical interaction dynamic in which the human participant experiences an emotional response and the system functionally adapts the subsequent output to recognised emotionally meaningful signals, with an observable impact on human engagement, interpretation, or action.	Does not imply that the AI experiences emotions, possesses human empathy, or understands feelings in a human way. It refers to the dynamics of the interaction rather than an internal emotional state of the system.
Integrated intelligence	A possible emergent systemic property of the human–AI relational and dynamic configuration, manifested through functional coupling, resonant and recursive transformation of contributions, and human validation of the outcome.	Not a separate entity, a general consciousness, a self-contained sentient being, or an automatic result of the use of AI. Its identification requires process and outcome evidence.
Cognitive resonance	A traceable dynamic in which machine-generated input, after human interpretation and judgement, helps transform human understanding, questions, criteria, or decisions.	It cannot be established from the usefulness or quality of a single response and does not imply human-like understanding on the part of the AI.
Cognitive resonator	A functional role of an AI system in which generated analyses, critiques, frameworks, questions, or connections help transform human understanding.	The term denotes a contextual role of the system, whereas “cognitive resonance” denotes a process that may occur through interaction. The presence of the role does not guarantee that the process will occur.
Co-creative episode	An analytically bounded sequence of linked dialogic moves and one or more recursive loops that culminates in a product, an intermediate result, a change of goal, or an interruption of the work.	Basic unit of process analysis. Its boundaries are defined by the task, purpose and traceable context, not necessarily by a single technical session.

<i>Term</i>	<i>Working definition in the present work</i>	<i>Distinction and note</i>
Co-creative dialogue space	A relational, informational, and communicative environment in which human and machine-generated inputs are presented, interpreted, verified, compared, and transformed in relation to a specific task.	Not a physical place, collective consciousness, or independent entity. Its boundaries are defined by the accessible, relevant and traceable context.
Configuration model	A model according to which the manifestation of integrated intelligence depends on the specific combination and functional connectivity of human actors, AI systems, roles, resonant processes, task, context, co-creation, and outcomes.	Does not imply a linear sequence, equal weight or necessarily maximum manifestation of each component. Different configurations can give rise to different interaction profiles.
Creative stimulation	Functional impact of machine-generated suggestions, differences, combinations, questions, or alternatives on human idea generation and rethinking.	It may be a one-off occurrence and does not in itself establish creative resonance or co-creation. It develops into creative resonance only through a traceable recursive transformation of the space of understanding or decision-making.
Traceability	The ability to reconstruct inputs, sources, checks, changes, decisions and their relationship to the final product through preserved evidential traces.	It is not merely administrative documentation but a methodological condition for reaching a reasoned conclusion about the process. It does not in itself guarantee co-creation, quality or veracity.
Recursive loop	A recurring sequence comprising input, human interpretation, verification or feedback, and the subsequent transformation of the proposal, goal, criteria or product.	Each cycle modifies the available context and conditions for subsequent actions. Mere repetition without meaningful transformation is not enough.
Relational configuration	The organisation of the functional relationships among the human participant, the AI system, the task, the data, the tools used and the socio-institutional environment.	Observed system properties relate to the organisation of the interaction and are not automatically attributed to an isolated component.

<i>Term</i>	<i>Working definition in the present work</i>	<i>Distinction and note</i>
AI system	A technical and organisational system comprising one or more AI models, interfaces, data, rules, infrastructure, and procedures for human use and control.	A broader concept than either “AI model” or “AI agent”.
AI model	A computing engine trained or designed to process input data and generate predictions, classifications, representations, content, or other outputs.	It is not necessarily an AI system or an autonomous agent. Generative capacity does not presuppose consciousness, understanding or moral responsibility.
AI agent	A functional technical configuration that perceives information, selects or performs actions, and uses an AI model to pursue defined goals within specified rules and constraints.	„Agent“ is used in a functional and engineering sense. The term does not imply human-like agency, autonomous intention, consciousness, or moral responsibility.
Sociotechnical system	An organised system of people, technology, rules, resources, practices, and institutional settings whose interaction determines the functioning and consequences of technology use.	Technical properties and outcomes are not considered in isolation from human practices, power relations, norms and contexts of use.
Co-created product	An idea, text, model, figure, solution, project, or other artefact whose concrete form has arisen through a recursive and traceable transformation of distinguishable human and machine-generated contributions.	It is not a mechanical aggregation of contributions. Quality, novelty or persuasiveness do not in themselves establish co-creation or automatically confer the status of knowledge.
Creative resonance	A traceable recursive dynamic in which human and machine-generated inputs transform the criteria, ideas, or space of possible solutions in the creative process.	It is not a single act of generation, the accumulation of variants or automatic reciprocity between equal creative subjects. It does not replace human creativity or value judgement.
Functional reciprocity	A process condition in which the subsequent contribution of one component depends on the previous contribution of the other and changes the conditions for the next action in the interaction.	Denotes two-way functional dependence, not symmetrical agency, equal understanding, equal authorship, or shared moral responsibility.

<i>Term</i>	<i>Working definition in the present work</i>	<i>Distinction and note</i>
Functional role of AI	The specific function performed by the AI system in a given episode, e.g., tool, assistant, cognitive resonator, modulator, or asymmetrical co-creator.	The role is analytical, contextual and variable. It is not a permanent essential property of the system and does not determine its moral or legal status.
Human agent	A cognitive, social, and moral entity that formulates or accepts goals, interprets context, evaluates information, creates and negotiates meanings, makes decisions, and takes responsibility for actions and outcomes.	Can be an individual or an organised human collective. It is not a passive recipient of machine outputs, but its actions are also conditioned by social, institutional and technical factors.
Human validation and responsibility	The human function of interpreting, verifying, justifying, evaluating, accepting, modifying, rejecting or finalising the outcome.	AI's functional contribution does not transfer academic, professional, or moral responsibility to the system. Copyright and legal status are determined according to the applicable norms and institutional context.

CONCEPTUAL DIFFERENCES

Emergence, autonomy and consciousness

The emergent system property belongs to the organisation and dynamics of the interaction, not necessarily to any of the participating components individually. No autonomous agency or intention, consciousness, shared intelligence, moral status, or equal subjectivity of humans and AIs follow from its presence.

Emotional resonance and emotions

Emotional resonance describes the functional impact of an adapted machine response on human engagement, emotional attitude, interpretation, or subsequent action. It does not mean that the AI experiences emotions, has human empathy, or understands feelings the way humans do. Resonance is a characteristic of the observed interaction, not evidence of an internal emotional state of the system.

Identification, measurement, evaluation and validation

Identification establishes whether the observed interaction exhibits predetermined criteria and indicators. Measurement determines the degree, frequency, intensity or profile of these manifestations. Evaluation assesses the quality, significance, or acceptability of the process and outcome against set standards. Validation examines whether the method and indicators actually measure or establish the intended construct. Reliability, which refers to the stability and repeatability of the measurement, should be checked separately. These are interrelated but different analytical tasks.

Integrated and augmented intelligence

Augmented intelligence refers to the enhancement or expansion of human cognitive and practical abilities through technology. In the current framework, integrated intelligence implies a further recursive and traceable transformation of human and machine inputs into the process of solving a task or creating a product. Therefore, mere technical assistance is not a sufficient basis for identifying integrated intelligence.

Integrated intelligence and distributed or augmented cognition

Distributed cognition explains how cognitive functions and representations are deployed across people, artefacts, and environments. Augmented cognition examines the conditions under which external means can be functionally incorporated into the cognitive process. The construct “integrated intelligence”, as defined in the present work, adds criteria for resonant and recursive transformation, functional asymmetrical co-creation, traceable product genealogy, and preserved human meaning-making, value judgement, and moral responsibility.

Integrated, hybrid and symbiotic intelligence

Hybrid intelligence typically emphasises the coordinated combination of various human and machine capabilities. Symbiotic intelligence emphasises long-term functional complementarity and mutual adaptation. Integrated intelligence, in the sense adopted in the present work, denotes a possible relational configuration characterised by resonance, recursive transformation of contributions, traceable product genealogy, and ultimate human validation. The differences are analytical and partially overlapping, not absolute.

Intelligence and intellect

In this book, “intelligence” denotes an ability, quality, or set of functions, and “intellect” an organised system or configuration in which intellectual functions are performed. Therefore, the term is consistently rendered as “integrated intelligence” when naming the construct as an overall relational organisation. The distinction is operational and terminological, and not generally valid for all scholarly traditions.

Information and knowledge

Machine output initially has the status of generated information, a hypothesis, an interpretive proposal or a possible solution. It does not automatically acquire the status of grounded knowledge. This requires human interpretation, critical scrutiny, linking to evidence and inclusion in an appropriate meaningful context, and where the field requires it, institutional or expert validation. Information and knowledge are related but not identical epistemic categories. They are not necessarily consecutive stages in a linear process.

Creative stimulation, creative resonance and co-creation

Creative stimulation is the provoking of an idea, association, or new direction in human thinking. Creative resonance denotes a traceable and recursive transformation of understanding, criteria, or the space of possible solutions. Functional co-creation implies distinguishable, iteratively transformed and traceable contributions to product creation, with human judgement and responsibility

preserved. The terms denote different levels and different evidentiary strength and should not be used interchangeably.

Machine generativity and human creativity

Machine generativity produces variants by modelling patterns in data and probabilistically generating outputs. Human creativity is related to human agency and can include intention, experience, imagination, contextual meaning-making, and value judgement. Artificial intelligence can functionally stimulate, extend, and transform the creative process without implying that it possesses human creative experience, autonomous intention, or moral responsibility.

Process and outcome evidence

Process evidence shows how human and machine inputs originated, interacted, and were transformed. Outcome evidence refers to the qualities, applicability, and impact of the resulting product. High product quality does not in itself prove an integrated process, just as the presence of an integrated process does not guarantee a high-quality or reliable result. Therefore, both types of evidence are necessary but not interchangeable.

Resonance and a helpful or high-quality response

Resonance denotes a process change in subsequent human understanding, formulation of questions, criteria, choices, or actions that can be traced in the interaction. The usefulness, eloquence, persuasiveness, or high quality of a single machine response does not in itself prove resonance. It is necessary to establish how the response was interpreted, verified and translated into the human participant's subsequent steps.

Co-created product and knowledge

A co-created product may be an idea, text, model, solution, project, or other artefact, the formation of which has distinguishable and traceable human and machine contributions. Not every product represents knowledge. Epistemic status can be acquired by the statements, explanations, or models contained therein after human interpretation, justification, verification, and contextualisation. Novelty, persuasiveness and quality alone are not enough.

Functional co-creator and author

An AI system can perform a functional co-creative role when the input it generates is distinguishable, transformative and traceable in product development. This analytical definition does not make AI an autonomous subject, author, or bearer of moral responsibility or epistemic authority. Authorship, responsibility for verification, and the decision to use and publish the product remain human. The legal status should be determined according to the applicable legislation and the specific institutional context.

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(B) Thematic structure of the bibliography

A source may appear in more than one thematic group.

1. Philosophy, ontology and epistemology

Aristotle (2004)
Aristotle (2009)
Dewey (1938)
Gadamer (2004)
Heidegger (1962)
Husserl (1982)
Kuhn (2012)
Lakatos (1978)
Merleau-Ponty (2012)
Peirce (1931–1958)
Polanyi (1966)
Popper (2002)
Ricoeur (1981)
Whitehead (1978)

2. Cognitive science, psychology and theory of knowledge

Anderson (2007)
Anderson (2020)
Bandura (1986, 2001)
Barrett (2017)
Barsalou (2008)

Bruner (1990)
Clark (1997)
Clark & Chalmers (1998)
Damasio (1994, 1999)
Ericsson & Pool (2016)
Gardner (1983)
Gigerenzer (2007)
Goleman (1995, 1998)
Graziano (2013)
Johnson-Laird (1983)
Kahneman (2011)
Kolb (1984)
Lakoff & Johnson (1980)
Mayer (2021)
Newell & Simon (1972)
Norman (2023)
Rumelhart, McClelland, & PDP Research Group (1986)
Sloman & Fernbach (2017)

3. Systems theory, complexity and emergence

Ashby (1956)

Bertalanffy (1968)
 Capra (1996)
 Capra & Luisi (2014)
 Goldstein (1999)
 Holland (1992)
 Holland (1998)
 Maturana & Varela (1980)
 Meadows (2008)
 Mitchell (2009)
 Morin (2008)
 Prigogine & Stengers (1984)
 Sawyer (2005)
 Simon (1996)
 von Foerster (2003)
 Weick (1995)
 Wiener (1948)

4. Artificial intelligence

Akata et al. (2020)
 Anthropic (2024)
 Bengio (2023)
 Boden (2016)
 Bommasani et al. (2021)
 Brown et al. (2020)
 Goodfellow et al. (2016)
 Gemini Team, Google (2023)
 Kelly (2015)
 Liu (2023)
 McCarthy (2007)
 McDermott (1976)
 Mitchell (2019)
 Moravec (1988)
 OpenAI (2023)
 OpenAI (2025a)
 OpenAI (2025b)
 Russell & Norvig (2021)
 Turing (1950)

5. Human–AI interaction

Amershi et al. (2019)
 Brave & Nass (2002)
 Cooper et al. (2014)
 Dix et al. (2004)
 Endsley (1995)
 Engelbart (1962)

Grudin (2017)
 Hollan, Hutchins & Kirsh (2000)
 Hollnagel & Woods (2005)
 IBM (2016)
 Licklider (1960)
 Nass & Brave (2005)
 Norman (1988)
 Norman (2004)
 Norman (2013)
 Parasuraman et al. (2000)
 Suchman (1987)
 Weiser (1991)

6. Hybrid, augmented and collaborative human–AI intelligence

Bredeweg & Kragten (2022)
 Brynjolfsson, Li & Raymond (2023)
 Brynjolfsson & McAfee (2014)
 Chen et al. (2026)
 Clore & Storbeck (2006)
 Colton (2008)
 Csikszentmihalyi (1996)
 Davenport & Kirby (2016)
 Davidson et al. (2003)
 Davis (2026)
 Davis et al. (2015)
 Dellermann et al. (2019)
 Doshi-Velez & Kim (2017)
 Floridi (2014, 2019, 2023)
 Floridi & Cowsls (2019)
 Forgas (2006)
 Gao et al. (2025)
 Hemmer et al. (2024)
 Jarrahi (2018)
 Jordanous (2016)
 Kamar (2016)
 Lubart (2005)
 Miller (2019)
 Norman (2004)
 Picard (1997)
 Raisch & Krakowski (2021)
 Runco & Jaeger (2012)
 Sawyer (2007)
 Seeber et al. (2020)
 Shneiderman (2022)

Sternberg (1999)

7. Emotion, creativity and co-creation

Akata et al. (2020)
Clark & Chalmers (1998)
Clore & Storbeck (2006)
Colton (2008)
Csikszentmihalyi (1996)
Davidson et al. (2003)
Forgas (2006)
Hutchins (1995)
Jordanous (2016)
Lubart (2005)
Norman (2004)
Picard (1997)
Runco & Jaeger (2012)
Sawyer (2007)
Sternberg (1999)

8. Collective and organisational intelligence

Albrecht (2003)
Argyris & Schön (1978)
Argyris & Schön (1996)
Cannon-Bowers et al. (1993)
Choo (1998)
Edmondson (2019)
Hevner et al. (2004)
Lévy (1997)
Malone (2018)
Malone, Laubacher & Dellarocas (2010)
Matsuda (1992)
Nonaka (1994)
Nonaka & Takeuchi (1995)
Porter & Heppelmann (2014)
Salas et al. (2008)
Senge (1990)
Simon (1996)
Snowden & Boone (2007)
Sunstein (2006)
Surowiecki (2004)
Wiig (1997)
Woolley, Aggarwal & Malone (2015)

Woolley et al. (2010)

9. AI ethics, governance and standards

Anthropic (2024)
Bostrom (2014)
Council of Europe (2024)
European Commission (2020)
European Parliament & Council of the European Union (2024)
High-Level Expert Group on Artificial Intelligence (2019)
IEEE (2019)
ISO 31700-1:2023 Privacy by Design
ISO 9241-210:2019 Human-centred design
ISO/IEC 22989:2022
ISO/IEC 23894:2023
ISO/IEC 38507:2022
ISO/IEC 42001:2023
ISO/IEC 5338:2023
ISO/IEC TR 24028
ISO/IEC TR 24368
Jobin et al. (2019)
NIST AI 600-1 (2024)
NIST AI RMF (2023)
NIST AI RMF Playbook
OECD (2019)
OECD AI Observatory
UNESCO (2021)
United Nations (2015)
World Economic Forum (2023)

10. Research methodology and validation

Boateng et al. (2018)
Braun & Clarke (2006)
Campbell & Fiske (1959)
Cohen (1960)
Kline (2023)
Krippendorff (2018)
McGraw & Wong (1996)
Messick (1995)
Shadish et al. (2002)
Snyder (2019)
Yin (2018)

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Olya Harizanova holds a Doctor of Sciences degree and is a Leading Researcher (R4) in the Faculty of Philosophy at Sofia University “St Kliment Ohridski”. Until 2024, she was Professor of Information Retrieval Systems at the same university, where she continues to teach courses related to the development and application of information and communication technologies.

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Over the past twenty-five years, she has participated in more than sixty projects, several of which she has led. She is currently the Lead Coordinator of project BG16RFPR002-1.014-0011, “Sustainable Development of the ‘Heritage BG’ Centre of Excellence”, funded under procedure BG16RFPR002-1.014 of the Research, Innovation and Digitalisation for Smart Transformation Programme. She is also a member of the research team working on the project “Economic Effects and Risks of the Rapid Adoption of Artificial Intelligence Technologies in the Economy and Finance” (KП-06-H85/7), funded by the Bulgarian National Science Fund at the Ministry of Education and Science.

Her present book advances an original and conceptually developed theory of integrated intelligence—not as a completed dogma, but as an open research programme intended to stimulate scholarly dialogue. It presents a conceptual framework for integrated intelligence as a reasoned theoretical proposition that:

- introduces its own conceptual architecture;
- raises significant research questions;
- offers concepts and a methodology for discussion and testing;
- defines its own boundaries and limitations;
- allows for falsification, refinement, and alternative explanations;

- outlines opportunities for subsequent empirical research.

The author does not seek to “close” the subject, but to establish a scholarly foundation in relation to which other researchers may take a position by confirming, challenging, operationalising, or further developing the proposed theory.

Olya Harizanova

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