Towards an Integrative Meta-Framework of the Evolutionary Firm

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Abstract

Evolutionary economics, especially in its endeavor to elucidate the behavior of firms, confronts notable integrative challenges that have constrained its ascension as a mainstream alternative within economics vis-à-vis classical paradigms. Central among these challenges are the dispersion, fragmentation, and reductionism inherent in the accumulation of knowledge. Nevertheless, the integration of evolutionary knowledge stands as a main driver for disciplinary advancement, offering a pathway to holistic comprehension, innovation stimulation, methodological enhancement, and improved applicability in policy and practice domains. In response to these impediments, a meta-framework for knowledge integration has been formulated. Rooted in foundational tenets derived from evolutionary biology, evolutionary economics, and firm-specific research, this integrated approach seeks to furnish deeper insights into the complex dynamics governing firms, while providing a more cohesive and structured comprehension of firm evolution by transcending disciplinary boundaries. The article concludes by outlining the implications of this meta-framework for scholarly inquiry and practical application, while identifying prospective avenues for future research.

Keywords: Evolutionary economics, Meta-framework, Firm behavior, Knowledge Integration.

1 Introduction

Evolutionary studies have greatly enhanced our comprehension of fundamental natural and social phenomena, spanning from biological evolution to cultural and societal changes. Originating from humanity's enduring quest to understand life's origins and development, the notion of evolution can be traced to the intellectual explorations of early civilizations in antiquity. Early inklings of transformation of species over time appear in the works of philosophers Anaximander and Empedocles, dating back to the 6th century BC (Delisle 2019; Dercole and Rinaldi 2008; Glass 1968; Himmelfarb 1968). Nonetheless, it wasn't until the 19th century that evolutionary thought began to crystallize into a formal scientific discipline.

Charles Darwin's 1859 seminal work "On the Origin of Species" (1964) laid the foundation for modern evolutionary theory. Darwin proposed the mechanism of natural selection as the driving force behind evolution, whereby organisms with advantageous traits are more likely to survive and reproduce, passing on those traits to subsequent generations. This revolutionary idea sparked intense debate and controversy during and after Darwin's own life, challenging traditional religious and philosophical beliefs about the origins of life. Notwithstanding, evolutionary thought did not solely stem from the contributions of a single man. While Darwin's work catalyzed the formalization of evolutionary theory, its development was the result of a rich tradition and the convergence of multiple disciplines shaped by a diverse array of thinkers spanning various fields (Prestes 2023; Brake 2016; Deichmann and Travis 2010).

Early scholars in the tradition of evolutionary thought commonly explored patterns of change and adaptation across biological, cultural, and social contexts. Anthropologists like Herbert Spencer and Lewis Henry Morgan explored the evolution of human societies and cultures, laying the groundwork for the field of cultural evolution. Likewise, sociologists such as Émile Durkheim and Max Weber investigated social change and the evolution of institutions within societies. Moreover, the interdisciplinary character of evolutionary thought became apparent as it began incorporating insights from more diverse fields, including psychology, archaeology, and linguistics. Each discipline provided distinctive perspectives on the mechanisms and processes of change, thereby enhancing our comprehension of evolution in its widest scope.

Evolutionary economics, akin to other evolutionary branches in the social sciences, aligned with tradition by applying principles of variation, selection, and adaptation to economic dynamics. Pioneering economists like Thorstein Veblen and Joseph Schumpeter drew parallels between biological evolution and economic processes, emphasizing innovation, competition, and adaptation's role. The evolutionary theory of the firm, introduced in the early 1980s by Richard Nelson and Sidney Winter (1982), deepened this connection. They advocated for examining firm behavior and organizational change through the lens of principles such as variation, selection, and retention. Their approach underscored the importance of routines, capabilities, and organizational learning in shaping the evolution of firms. Additionally, evolutionary economics acknowledged historical contingency and path dependence's importance in shaping economic outcomes. Such a perspective underscored that current economic systems result from cumulative historical processes, with past events exerting lasting influence.

As evolutionary theory continued to progress, shedding light on a myriad of phenomena from the origins of life to the behaviors of organisms and human societies, its potential as an integrative framework and alternative to classical thought remains unrealized. This is especially evident in evolutionary economics, where despite continuous efforts to integrate evolutionary principles into economic theory, the field remains on the periphery of the economics profession, largely overshadowed by the dominance of neoclassical models in mainstream economics. An important critique concerns perceived deficiencies in formalization and integration within the field. Furthermore, evolutionary economics confronts contemporary challenges, including those stemming from technological advances, environmental sustainability concerns, and geoeconomic disparities. These challenges are amplified by increasing demands for evolutionary economic principles to inform policy responses to disruptive changes, thereby intensifying scrutiny of the field's efficacy in addressing a wide array of issues, including innovation policies, industrial strategies, and environmental regulations.

This article aims to advance the formalization and integration of evolutionary thinking in the study of firms as dynamic, living entities. By constructing a meta-framework, this research seeks to consolidate the core structural components and their interconnections into a comprehensive analytical model of the evolutionary firm. The effort is designed to address existing barriers that hinder the effective application of evolutionary thinking by scholars and practitioners. Ultimately, the goal is to deepen our understanding of firms and their behavioral dynamics.

The subsequent sections fulfill distinct objectives to achieve this aim: Section 1 establishes the foundation by delineating the historical trajectory of evolutionary thought and its integration into economics, highlighting the interdisciplinary nature of evolutionary studies. **Section 2: Summary of Weaknesses in the Literature identifies and discusses the main weaknesses in the existing literature pertaining to evolutionary analysis of firms, providing a critical overview of the current state of evolutionary economics research. Section 3: Description and Explanation of the Evolutionary Framework from Biology utilizes Bowler's "Evolution" book as a reference to elucidate the components and main relationships of the evolutionary framework from biology, establishing the theoretical underpinnings for subsequent analysis. Section 4: Construction of a Meta-framework for the Evolutionary Analysis of the Firm proposes a meta-framework tailored to the analysis of firms, integrating insights from evolutionary economics and related fields to provide a comprehensive approach to studying firm behavior. Section 5: Discussion of the Main Consequences of the**

Meta-framework explores and discusses the implications of the proposed meta-framework for evolutionary analysis of firms, elucidating its potential contributions to scholarly inquiry and practical application. Section 6: Limitations and Future Lines of Research acknowledges the limitations of the research conducted and outlines potential avenues for future research in evolutionary economics and the analysis of firm behavior. Finally, Section 7: Conclusion offers a succinct summary of the main contributions of the paper, highlighting the significance of the proposed meta-framework and suggesting directions for further exploration in the field of evolutionary economics.

2 Challenges in Evolutionary Firm Knowledge Building

The lack of integration of evolutionary knowledge remains a significant obstacle that impedes the advancement and adoption of evolutionary ideas in the theory of the firm. This challenge reflects a broader epistemological issue, as knowledge integration is a key process driving scientific progress. When knowledge becomes too dispersed across various disciplines, fields, and paradigms, the result very often is a conspicous lack of cohesion and unity in scientific understanding. Moreover, when the dispersion of knowledge is coupled with fragmentation –a common feature of disciplinary progress– both factors can hinder scientific advancement and complicate the synthesis of findings into a cohesive framework. At this point, establishing connections and identifying commonalities between different areas of knowledge becomes increasingly difficult.

When this occurs, different paradigms can be incommensurable, making it challenging for scholars working within distinct frameworks to communicate and build on each other's work [Kuhn-3]. This often leads to the development of specialized terminologies and conceptual frameworks that are difficult to reconcile. As a result, significant insights and breakthroughs may go unnoticed or undervalued due to their confinement within narrow disciplinary boundaries. Foucault noted that discursive formations can develop their own internal logics and rules, constraining what is considered legitimate knowledge [5]. This marginalizes ideas that do not fit neatly within established frameworks. Furthermore, the lack of knowledge integration poses challenges for the scientific community in addressing complex, real-world problems that require a multidisciplinary approach. Issues such as climate change, public health, and social inequality often encompass interrelated dimensions across the natural and social sciences.

Addressing the lack of knowledge integration in evolutionary thought thus beomes crucial for overcoming these challenges. This paper examines how dispersion, fragmentation, and reductionism undermine knowledge integration in the evolutionary approach to the firm by creating silos, limiting interdisciplinary communication, and fostering narrow research focuses. Additionally, we discuss how our proposed meta-framework can contribute to a more holistic and integrated approach to understanding firm behavior from an evolutionary perspective.

2.1 Knowledge Dispersion

Knowledge dispersion refers to the widespread distribution of information across diverse sources, disciplines, and domains. It reflects the multiplicity of perspectives, theories, and methodologies that exist within different areas of knowledge. Dispersion in evolutionary studies of the firm is evident in the varied insights found across the numerous subfields, publications, and researchers.

Each discipline offers specialized insights into distinct aspects of firm behavior—spanning organizational structures, management practices, leadership dynamics, technological advancements, and more. Together, these contributions form a rich tapestry of perspectives aimed at enhancing our broader understanding of the firm within the academic landscape. However, in such a dispersed environment, knowledge takes on different forms and becomes accessible primarily to individuals within specific fields, fostering information asymmetry between disciplines. Experts within their domains can readily access and utilize relevant knowledge, while those outside these fields often encounter barriers that hinder interdisciplinary collaboration and exchange. Furthermore, dispersion promotes specialization within disciplines, as researchers focus deeply on narrow topics within their areas of expertise, further fragmenting knowledge into specialized subfields.

In the field of evolutionary thought, the dispersion of knowledge arises from a complex interplay of historical, interdisciplinary, and methodological factors, highlighting the diverse and multifaceted nature of evolutionary inquiry. Over time, evolutionary theory has given rise to various paradigms and theoretical frameworks, each reflecting different interpretations and emphases within the discipline. Interdisciplinary engagement has been central to this dispersion, intersecting with numerous fields such as biology, anthropology, psychology, sociology, and economics. Each discipline approaches evolutionary phenomena from its unique perspective, leading to diverse interpretations and methodologies. Consequently, evolutionary insights become dispersed across disciplinary boundaries, reflecting the varied lenses through which scholars from different fields view evolutionary processes.

The broad applicability of evolutionary principles to diverse phenomena further contributes to this dispersion. From biological evolution to cultural dynamics and economic behavior, evolutionary concepts resonate across a wide array of domains, resulting in the dispersion of evolutionary insights across disparate fields of study. Methodological pluralism within evolutionary thought further amplifies this dispersion. Scholars employ a variety of empirical, qualitative, mathematical, computational, and comparative approaches to investigate evolutionary processes, each yielding unique insights and perspectives. These methodological preferences vary across disciplines and research traditions, creating a highly dispersed landscape of evolutionary inquiry.

2.2 Knowledge Fragmentation

Knowledge fragmentation involves the compartmentalization and isolation of information into distinct fragments or disciplines, each characterized by specific boundaries and specialized focus areas. Fragmentation creates disciplinary silos where researchers operate within narrow domains of expertise and research, often with limited interaction or collaboration across fields. These silos are upheld by disciplinary boundaries that define the scope of each field and restrict the flow of information and ideas between disciplines. As a result, researchers within fragmented fields may adopt reductionist approaches, simplifying complex phenomena to fit within their disciplinary frameworks.

The impact of knowledge fragmentation can be profound, creating barriers to the integration and synthesis of knowledge across disciplines. By reinforcing disciplinary boundaries, fragmentation impedes interdisciplinary collaboration and hampers efforts to develop comprehensive, holistic understandings of complex phenomena. Moreover, fragmentation can lead to a narrow perspective among researchers, who may become entrenched in their disciplinary viewpoints and methodologies, potentially overlooking valuable insights from other fields. This narrow focus can result in duplicated efforts as researchers within fragmented disciplines inadvertently replicate studies or fail to consider relevant findings from complementary fields, resulting in inefficiencies and redundancy.

The fragmentation of evolutionary thought into disciplinary silos and compartments is driven by a combination of historical, methodological, and institutional factors that continue to influence the field today. These factors have significantly shaped the evolution and structure of evolutionary studies. Despite efforts to promote interdisciplinary collaboration and integration, disciplinary boundaries persist, often reinforced by institutional structures, funding mechanisms, and academic incentives. These boundaries limit the exchange of ideas and hinder the development of comprehensive, holistic understandings of evolutionary processes. For example, evolutionary economics and evolutionary biology often operate in separate academic spheres, with economists focusing on market dynamics, innovation, and firm behavior, while biologists concentrate on genetic and ecological aspects of evolution. This separation is maintained by distinct funding sources, specialized journals, and academic departments, which can discourage collaboration and the sharing of insights between these disciplines. As a result, important connections between biological evolution and economic behaviors may be overlooked or underexplored, such as how evolutionary principles can inform the understanding of market adaptations and organizational strategies. Overcoming these challenges requires dedicated efforts to break down interdisciplinary barriers, encourage collaboration among scholars from different disciplines, and integrate diverse perspectives within the field of evolutionary thought.

2.3 Knowledge Reductionism

Reductionism involves dissecting complex phenomena into isolated components or subsystems, often at the expense of understanding the system as a whole and neglecting a holistic perspective. While this approach can yield valuable insights, it can also obscure the broader context and interconnections between different parts of a system. When scholars focus on isolated elements rather than the interactions and relationships among them, reductionism limits the scope of research and the potential for integrative theories and solutions.

In evolutionary economics and the evolutionary analysis of the firm this reductionist tendency appears when scholars concentrate solely on specific aspects or subtopics without considering the interconnectedness and interdependencies within the broader evolutionary framework. For example, researchers might focus exclusively on technological innovation within firms, analyzing how specific advancements influence firm performance. While this focus is valuable, it may overlook the interactions between these innovations and other factors such as market conditions, regulatory environments, and organizational culture. Without considering these interactions, the analysis remains incomplete and potentially misses key insights into the firm's overall evolutionary dynamics.

The risks associated with reductionist approaches are multifaceted. First, reductionism can result in a loss of context, where researchers fail to recognize the broader factors influencing economic evolution and firm behavior. By isolating specific components or mechanisms, scholars may overlook the environmental, social, and institutional dynamics that shape evolutionary processes within the economic landscape. Second, reductionism may fail to capture emergent properties inherent within complex economic systems. For instance, in evolutionary economics, interactions among diverse economic agents and institutions often give rise to emergent phenomena that cannot be understood by examining components in isolation. Failure to recognize and account for these emergent properties may lead to a limited understanding of economic evolution and dynamics.

Furthermore, reductionism may impede the ability to effectively address complex problems. Many economic phenomena, including firm behavior and market dynamics, are inherently complex and multifaceted, requiring a holistic understanding to develop comprehensive solutions. Scholars using reductionist approaches often overlook the interconnections and interactions crucial for understanding complex systems, leading to incomplete or erroneous conclusions that fail to address the full scope of a problem. Ultimately, reductionist approaches that oversimplify these problems may result in inadequate policy prescriptions or managerial interventions that do not address their underlying complexity.

Reductionism can also impede interdisciplinary collaboration and knowledge integration within evolutionary economics and the evolutionary analysis of firms. Given the inherently interdisciplinary nature of these fields, effective research often necessitates integrating insights from diverse disciplines, including economics, biology, psychology, and sociology. Reductionist tendencies restrict researchers' capacity to engage with broader interdisciplinary questions and inhibit the synthesis of knowledge across different domains. Consequently, this overspecialization may stifle the advancement of the discipline by limiting opportunities for innovation and the cross-fertilization of ideas.

3 The Rationale of the Meta-Framework

Despite the absence of a universally accepted definition within qualitative research, frameworks have emerged as instrumental tools bridging the gap between theoretical constructs and empirical observations (Partelow 2023; Mollinga 2008). Framework analysis is a structured approach to thematic analysis that facilitates comparison by organizing data within a framework of themes derived both inductively and deductively. This qualitative research method combines detailed data description with abstraction, enabling a systematic analysis that examines relationships and patterns across the dataset (Goldsmith 2021).

In recent decades, the utility of frameworks have transcended disciplinary boundaries, attracting significant attention across a wide spectrum of scientific fields, including the natural and social sciences, technological advancements, education, and environmental studies, to name a few. Its widespread adoption is further evidenced by the routine application of established frameworks by scientific and professional organizations, as well as policymakers worldwide.

The value of frameworks also extends to the realm of academic research. They provide a structure for operationalizing and organizing scientific knowledge, fostering the development of a shared language, and promoting standardized research processes (Binder et al. 2013). Broadly, two primary categories of frameworks can be identified: those designed to capture the complex workings of a phenomenon or system, and those focused on simplifying core concepts. Beyond their specific aims, frameworks serve as a resource of reference for scholars and practitioners. They facilitate the navigation of complex interactions between diverse phenomena, ultimately enhancing the analysis and integration of emerging knowledge (Pulver et al. 2018).

From an epistemological standpoint, frameworks, regardless of their development approach (top-down or bottom-up), play a pivotal role in bridging the divide between various levels and scales of scientific knowledge. They connect broader, more general knowledge structures like paradigms or grand theories with more specific levels like models or case studies. In essence, frameworks are designed to “organize diagnostic, descriptive, and prescriptive inquiry, providing the basic vocabulary of concepts and terms to construct the causal explanations expected by a theory” (Partelow 2023). Ultimately, frameworks streamline the scientific process by guiding researchers in study design and offering a foundation of key concepts and measurable, comparable, and evaluable fundamental knowledge.

3.1 The Value of Meta-Frameworks

Meta-frameworks prevent researchers from constantly "reinventing the wheel" with each new investigation. Instead, meta-frameworks facilitate advancements by allowing researchers to apply them to less explored areas or integrate them with novel knowledge from other disciplines. Meta-frameworks further empower researchers by contextualizing their work within a specific field, providing a robust collection of interconnected concepts, theories, and paradigms with demonstrated utility in that domain (Cox et al. 2016). This not only facilitates knowledge synthesis and focus on key concepts and their relationships, but also stimulates scholarly discourse, fosters collaborative and interdisciplinary research endeavors, and lays the groundwork for subsequent empirical studies and effective communication of advancements and discoveries.

Despite their recent proliferation and wide-ranging applications across science, governance, and policy-making, concerns regarding meta-framework creation and use still persists. Critics argue that meta-frameworks can become "black boxes," lacking transparency in concept selection and relationship establishment. However, meta-frameworks typically emerge from a foundation of prior knowledge and experience, combined with empirical synthesis processes that integrate existing knowledge with research findings to develop more comprehensive frameworks.

As with other qualitative analysis systems, it is true that following development, meta-frameworks require operationalization, presenting challenges for both creators and users. Strategies need to be devised for case selection, synthesis activities, and integration with real-world data. These challenges underscore the critical importance of transparent and systematic methodologies for meta-framework synthesis.

3.2 Benefits of the Meta-Framework

The construction of a meta-framework on evolution is driven by its numerous potential benefits and contributions to the field. Firstly, a meta-framework, essentially a synthesis of existing frameworks, offers a robust methodological approach to address the dispersed nature of knowledge on the concept and process of firm evolution. By integrating insights from evolutionary economics, organizational theory, and related disciplines, our meta-framework establishes a unifying structure that bridges diverse research strands related to evolutionary firm behavior. This holistic perspective, which connects micro-level organizational dynamics with macro-level environmental influences, offers substantial advantages. A meta-framework serves as a valuable tool for both scholars and practitioners, enabling them to craft more effective strategies for managing organizational change, promoting innovation, and adapting to dynamic market conditions.

Secondly, the meta-framework serves as a methodological bridge, linking theoretical concepts with empirical observations in the evolutionary analysis of firms. It offers a structured approach for organizing diagnostic, descriptive, and prescriptive inquiries, providing researchers with a standardized vocabulary of core concepts and essential terms for building causal explanations. This systematic methodology promotes rigor and coherence in research, facilitating clearer interpretation of empirical findings and driving theoretical advancements in understanding firm behavior.

Thirdly, the meta-framework facilitates interdisciplinary collaboration by establishing a shared language and conceptual framework for scholars and practitioners across diverse disciplinary backgrounds. By transcending disciplinary boundaries, the meta-framework encourages the exchange of knowledge and collaboration among researchers, fostering innovative insights and perspectives. This interdisciplinary approach is increasingly important for addressing complex research questions that necessitate multifaceted analyses drawing from multiple knowledge domains.

Fourth, the step-by-step procedural approach used to construct the meta-framework ensures a high degree of transparency. This clarity enables a precise delineation of the systematic processes involved in data analysis, from descriptive exploration to explanatory inference. The transparency also extends to the researchers' interpretive efforts, providing a clear and traceable progression of analytical insights in studies focused on evolution and the behavior of the firm.

Fifth, unlike other qualitative data analysis approaches such as grounded theory, narrative methods, or phenomenology, constructing a meta-framework adopts a pragmatic epistemological stance, thereby accommodation to a wider range of data types and research contexts (Goldsmith 2021; Gale et al. 2013). Such flexibility is crucial for this investigation, as it relies primarily on secondary data from both conceptual and empirical studies on evolution across the natural and social sciences. By synthesizing insights from diverse disciplines, the meta-framework enables a comprehensive perspective that transcends traditional boundaries, fostering a deeper understanding of evolutionary dynamics within firms.

In conclusion, developing a meta-framework aligns with the research objectives of this study, providing a comprehensive and systematic approach to analyzing the evolutionary dynamics of firms. It fosters interdisciplinary collaboration, supports the advancement of theoretical frameworks, and significantly contributes to the progress of evolutionary economics.

4 Methodology

The construction of a robust meta-framework requires a systematic, step-by-step approach for synthesizing diverse data and existing frameworks into a cohesive and comprehensive higher-order framework. Each methodological step is designed to ensure organized, rigorous analysis and thorough synthesis of qualitative data. This approach ensures that the resulting meta-framework possesses both theoretical robustness and empirical grounding, ultimately enhancing its practical relevance and applicability. This section describes the specific steps that have been used in the construction of the meta-framework.

4.1 Familiarization with Literature

Before delving into the detailed construction of the meta-framework, an exploratory review of the extant literature was conducted covering the fields of evolution in the natural sciences, evolutionary economics and the theory of the firm, and other related areas within the social sciences, including sociology, anthropology, psychology, and political science. The primary objective was to gather as many different and interdisciplinary perspectives as possible, identify knowledge gaps, grasp the current state of knowledge, and pinpoint the most pertinent theories, models, and existing related frameworks. By completing the familiarization step first, the meta-framework was built on a solid foundation of prior research, ensuring its alignment with established knowledge.

During the familiarization phase, the focus was on developing a broad understanding of key evolutionary concepts and their applications, as well as identifying interdisciplinary connections and the complexity of the field, rather than conducting a comprehensive review of all available studies. To achieve this, the process involved a targeted search for high-quality articles from major peer-reviewed databases (WOS and Scopus), as well as books and conference proceedings, all in English and without time restrictions. The search used various combinations of the term “evolution” along with related keywords such as “social,” “economics,” “firm,” “thinking,” and “history.”

While not exhaustive, this approach effectively identified key themes, recurring patterns, and emerging debates within the field of evolutionary studies. It enabled the mapping of the intellectual landscape and informed the development of the research questions and objectives. Additionally, it provided valuable insights into the diverse perspectives and frameworks that have shaped evolutionary thought over the past two centuries.

4.2 Research Questions and Objectives

The formulation of research questions and objectives builds on the insights gained during the initial familiarization with the literature. This phase is crucial for steering the synthesis process and ensuring the meta-framework's relevance. By identifying key themes and gaps within the reviewed literature, the familiarization stage provided a solid foundation for developing clear, focused research questions and objectives that address the specific issues highlighted in the review.

The SMART criteria (Specific, Measurable, Achievable, Relevant, and Time-bound) were applied to formulate clear and focused research questions and objectives, ensuring a structured and well-defined roadmap for the meta-framework development process. Additionally, the iterative nature of this process enabled the refinement of research questions and objectives as new insights emerged during the synthesis. This adaptability proved essential, as the discovery of new themes during the meta-framework synthesis often reshaped the initial research focus, ensuring alignment with the evolving understanding of the subject.

4.3 Specification of An A Priori Meta-Framework

The next step involved elucidating an a priori meta-framework that could serve as a baseline for the subsequent meta-framework synthesis. The process included the selection of a foundational or seminal work that comprehensively addressed the central ideas relevant to our research question. The selected work had to provide a robust theoretical and empirical basis for constructing a baseline meta-framework and serve as a reliable source for identifying the essential dimensions of evolution as a process. The seminal work chosen was from the field of evolutionary natural sciences, and the reasons were twofold. First, the work had a widespread recognition within the scientific community for its contributions to the understanding of natural evolution. Second, the work offered a valuable historical perspective on the trajectory of evolutionary thought, encompassing both mainstream and divergent ideas.

After choosing the seminal work, a thorough review was conducted to gain an in-depth understanding of its core arguments, methodologies, and conclusions. During this stage, the recurring themes, significant dimensions, and the relationships between the core themes were identified. This step was critical for capturing the structure of the ideas and their interconnectedness, forming the foundation of the a priori framework. The extracted information was then organized into thematic categories. These categories were carefully aligned with the research objectives and encompassed core themes that were directly relevant to the focus of the study, as well as peripheral themes that provided valuable context or supporting insights.

After completing the categorization process, the a priori meta-framework was refined to better align its themes and relationships with the specific goals of the research. This approach ensured that the resulting a priori meta-framework was grounded in established knowledge and tailored to serve as a structured template for mapping and coding new data in subsequent stages of the meta-synthesis, thereby enhacing coherence and completeness throughout the process.

4.4 Systematic Literature Reviews

Drawing from the literature familiarization, established research questions and objectives, and the a priori meta-framework from previous stages, a comprehensive two-pronged systematic literature review was conducted to identify new data and frameworks that either supported or expanded the a priori meta-framework. The first strand delved into the domain of evolutionary economics, with a particular focus on the analysis of firm behavior through an evolutionary lens. The second strand explored case studies that utilized evolutionary concepts and/or frameworks to investigate the dynamics of the firm. Each review employed a distinct search strategy to ensure methodological rigor and the identification of high-quality research. Both WOS and SCOPUS databases were targeted to maximize the rigor and quality of the search.

The first thematic review adopted a structured approach to identifying, evaluating, and synthesizing relevant scholarship pertaining to the fundamental tenets and interconnected concepts that characterize the evolutionary view of the firm. To capture the broadest possible range of ideas and perspectives, the review employed broad search terms and an extensive time-frame. The second review focused on case studies that analyzed firm behavior through an evolutionary lens. This review encompassed articles that explicitly contained the term "evolution" and/or "evolutionary" in their titles and those that analyzed the behavior of the firm in an evolutionary way although they did not explicitly contained the term "evolution" or "evolutionary" in the title. To identify the latter, a qualitative research technique known as "pearl-growing" was employed. This technique metaphorically refers to the process of iteratively accumulating valuable "pearls" of information by expanding the search based on references, citations, or recommendations found in an initial set of identified sources. In our context, the "pearls" were found after the valuable insights gained from the references and citations included in the first systematic literature review.

4.5 Meta-Framework Synthesis(Data Extraction and Thematic Analysis)

The next stage involved a two-step process of data extraction and analysis from selected studies. First, a systematic data extraction process was undertaken that collected relevant information from the selected studies, including verbatim quotes and key findings supported by the study data. This allowed the capture of all information necessary to address the research questions, ultimately forming a robust empirical foundation for the construction of the meta-framework.

After data extraction, all data were mapped and coded againts the a priori meta-framework established earlier. The process involved organizing the data in a meaningful manner to facilitate the identification of emerging patterns and relationships. Data coding was conducted thematically, adhering to the predefined themes identified within the a priori meta-framework, although the coding approach remained adaptable. Any relevant data that did not fit the themes of the a priori meta-framework were incorporated through an inductive approach. This allowed new themes and relationships to emerge from the data itself, ensuring the meta-analysis captured the full range of relevant information, even if it fell outside the a priori framework.

To enhance the rigor and efficiency of this process, qualitative data analysis software Atlas.ti was employed. While Atlas.ti does not supplant the researcher's critical role in data analysis and interpretation, it significantly bolsters the methodological rigor, efficiency, and overall quality of the research endeavor. Atlas.ti played a key role in streamlining data management and coding tasks while also facilitating visual analysis to identify patterns, themes, and relationships that might be less apparent through strictly textual methods.

4.6 Final Meta-Framework Specification

In the last stage of our meta-framework building process, the focus shifted towards refining the a priori meta-framework and ensuring the robustness of the meta analysis. A thorough review process was conducted to ensure the reliability and relevance of both the coding and the new themes emerging from it. This involved critical examination of the whole work, carefully evaluating each theme to ensure faithful representation of the data within or outside the scope of the a priori meta-framework. As a result, the initial a priori meta-framework was further refined and extended to achieve a more accurate reflection of the extracted data.

Next, the relationships between the new themes and the a priori themes were reexamined to generate meaningful insights into how they interact and influence one another. This interpretation, grounded in both the empirical data and the original a priori meta-framework, led to a revised conceptual meta-framework that provides a coherent and comprehensive explanation of the evolutionary behavior of the firm.

By adhering to these systematic steps, a final meta-framework was formulated, characterized by both rigor and adaptability. The meta-framework offers valuable insights that contribute to our understanding of evolutionary firm behavior. The transparent, comprehensive, and empirically grounded approach employed in its development ensures the meta-framework's robustness as a tool for advancing both theoretical and practical knowledge in the field of evolutionary firm analysis. Notably, the final meta-framework integrates the a priori themes with those newly identified during the systematic literature reviews. This comprehensive model captures the full spectrum of relevant themes and their interrelationships, providing a nuanced and detailed understanding of the studied concepts, relations, and data.

5 Results

5.1 Familiarization with Literature

The familiarization phase served as a preparatory step in the meta-framework elucidation process, providing a broad understanding of the diverse contexts in which "evolution" has been applied to explore fundamental questions across multiple disciplines. The goal was to establish a robust intellectual foundation by examining how evolutionary concepts and processes are used to analyze, explain, and predict phenomena across a wide range of knowledge areas. This stage enabled the identification of key theoretical frameworks, influential authors, and emerging trends in evolutionary thought, providing essential insights that informed the selection of a knowledge baseline for subsequent research stages.

Table 1 provides a summary of the various knowledge disciplines explored during the familiarization phase, detailing the number of works reviewed (594) and the range of years they cover.

Table 5.1: Table 1. Summary of literature screened during the familiarization phase. Source: own elaboration.

Discipline	Number of works	Years
Anthropology	6	2002-2023
Behavioral economics	16	1956-2022
Darwin/Darwinism	20	1968-2023
Other classical authors (Spencer, Lamarck)	19	1965-2015
Biology	106	1942-2024
Computing and IT	33	1988-2021
Cultural studies	5	2004-2020
Economics	208	1898-2024
Genetics	32	1953-2022
Neuroscience	7	1980-2023
Political science	8	2003-2022
Evolutionary thinking	52	1944-2023
Psychology	23	1978-2021
Sociobiology	14	1944-2021
Systems Biology	36	1934-2022

Discipline	Number of works	Years
Transdisciplinary thinking	9	1972-2023

The reviewed literature in the natural sciences encompassed various fields, including evolutionary biology, which examines the processes and mechanisms driving the diversity and complexity of life; darwinism, focusing on how species evolve over time due to environmental pressures and variation within populations; systems biology, which applies evolutionary concepts to analyze complex biological networks; genetics, focusing on heritable variation and mutation as drivers of change; and neuroscience, which examines how evolutionary mechanisms influence cognition and behavior.

In the social sciences, evolutionary approaches were found in disciplines such as economics, with its focus on dynamic processes of change, the role of innovation and technological development, path dependence, bounded rationality in decision-making, firm and industry heterogeneity, and the influence of institutional and cultural evolution on economic systems; psychology, exploring the evolutionary origins of behavior and cognition; anthropology and sociology, which examine the evolution of cultures and societies; and political science, which integrates evolutionary perspectives to understand the emergence of cooperation and conflict.

Furthermore, the review also included advancements in computational modeling and simulation of evolutionary systems using IT-based tools, offering robust frameworks for analyzing adaptation, selection, and emergent behaviors across natural, social, and artificial systems.

A key outcome of the familiarization phase was recognizing the inherently transdisciplinary nature of evolutionary studies. Evolution serves as a foundational explanatory paradigm not only within the natural sciences but also in social-related disciplines. By examining these diverse fields, the familiarization process sought to uncover common principles, distinctive disciplinary perspectives, and opportunities for integrating evolutionary theories across various domains.

Several key transdisciplinary trends emerged, including:

1. **Evolution as a Universal Framework**: The application of evolutionary principles beyond biology, in fields like systems science and social evolution, suggests a growing recognition of evolution as a unifying framework for understanding change and complexity.

2. **Integration of Genetics and Culture**: Emerging literature highlights the interplay between genetic evolution and cultural evolution, emphasizing the co-evolutionary dynamics that shape human societies and behaviors.

3. **The Role of Complexity and Systems Thinking**: A significant trend involves leveraging evolutionary theories to study complex systems, such as ecosystems, economies, and artificial intelligence, revealing insights into emergent properties and adaptive strategies.

4. **Focus on Mechanisms of Change**: Across disciplines, there is a shift towards understanding the mechanisms that drive evolutionary change, including innovation, cooperation, and adaptation in dynamic environments.

The familiarization process not only provided a panoramic view of evolutionary ideas but also laid the groundwork for selecting a knowledge baseline in the subsequent steps. The insights gained during this phase ensured that the chosen baseline would reflect the complexity, breadth, and depth of evolutionary frameworks across natural and social sciences, fostering a comprehensive and integrative analysis.

5.2 Research Questions and Objectives

Building on the key themes identified during the familiarization stage, the following research questions and objectives were established to guide the construction of the meta-framework:

1. How can evolutionary principles provide a unifying framework to analyze and understand firms' adaptive dynamics and complexities across diverse environments?
2. What are the core mechanisms driving firms' evolutionary trajectories, and how can these mechanisms inform strategies for uncertain business contexts?
3. How can biological metaphors and evolutionary analogies help elucidate the co-evolutionary strategies and behaviors of firms within competitive markets?

The following objectives were outlined to address the research questions:

- Analyze the potential of evolutionary principles as a universal framework for studying complexity and change within and across firms.
- Investigate the interactions between firms and industries, identifying key patterns and co-evolutionary dynamics that shape behavioral and strategic outcomes.

- Explore the application of systems thinking and complexity theory to the study of evolutionary firms, emphasizing the emergence of adaptive strategies in different contexts.
- Identify and synthesize the primary mechanisms of evolutionary change and assess their relevance to firm dynamics.
- Construct a comprehensive meta-framework integrating these insights to advance theoretical understanding and practical applications in the study of firms' evolutionary dynamics.

5.3 Selecting a Knowledge Baseline

Unlike traditional meta-framework synthesis approaches, which typically require extensive literature reviews, consultations, and deep topic expertise to develop an a priori framework, our approach focused on selecting a seminal work from the existing literature that thoroughly addressed the key concepts and relationships defining evolution in the natural sciences. This reference work provided a foundational knowledge base for elucidating our a priori framework, simplifying the subsequent coding and synthesis process while eliminating the need for extensive preparatory efforts.

The selected work was Peter J. Bowler's seminal book, "Evolution: The History of an Idea" (2009), which examines the historical trajectory of evolutionary thought and offers a comprehensive foundation for understanding the development of economic systems. Bowler's interdisciplinary perspective emphasizes the dynamic nature of economic processes as evolving systems shaped by continuous change. His analysis provides valuable insights for evolutionary economics by uncovering the historical origins of evolutionary ideas and their relevance to economic analysis.

Bowler's work is also relevant to our research for its exploration of the interplay between cultural, scientific, and anthropological factors in shaping evolutionary theories. In the book, the author traces the development of evolutionary thought from its origins in ancient Greece to its modern understanding, highlighting how societal beliefs and values influenced these concepts. His insights are particularly valuable for evolutionary economists, as it underscores the importance of understanding the cultural and ideological contexts in which economic systems emerge and evolve.

The author delves into the diverse contributions of key figures to evolutionary thought, examining the ideas and theories of prominent thinkers and highlighting their impact on the evolution of the field. Understanding this intellectual lineage enriches our a priori meta-framework by offering valuable insights into the historical foundations of contemporary economic theories and methodologies. Bowler's analysis further emphasizes the diversity of perspectives within evolutionary thought, providing a wide array of ideas to inform the analysis of evolutionary economic systems.

Ultimately, Bowler's book explores the controversies and debates surrounding the concept of evolution, highlighting the different interpretations and challenges to evolutionary theory throughout history. This aspect is particularly relevant for constructing our a priori meta-framework, as it emphasizes the complex and multifaceted nature of economic evolution. By examining historical debates over evolutionary theory, our a priori meta-framework gains a deeper appreciation for the contested nature of economic processes and the diverse array of factors that shape them. Bowler's nuanced analysis encourages critical engagement with evolutionary concepts and methodologies, fostering a more robust and interdisciplinary approach to studying economic systems.

In conclusion, Bowler's comprehensive treatise on evolution provides a robust foundation for understanding key themes in evolution and aggregate dimensions, serving as the baseline for elucidating our a priori meta-framework.

5.4 Elucidating the A Priori Meta-Framework

The a priori framework is a preliminary conceptual structure developed before the main meta-synthesis process begins. It serves as a foundation for organizing, analyzing, and interpreting data in a systematic manner. The main components of the a priori meta-framework include:

1. **Themes**: Broad, overarching concepts and categories that capture key aspects of evolutionary natural processes. Each theme and categories encapsulate essential aspects of evolutionary theory, illuminating the intricate mechanisms governing evolution and evolutionary behavior.
2. **Relationships**: Connections or interactions between the identified themes, illustrating how they influence or depend on each other.
3. **Guiding Structure**: A logical template or model that directs data mapping and coding during the synthesis process, ensuring coherence and alignment with the research objectives.

By providing a structured starting point, the a priori framework serves as a template for coding data extracted during the literature review in the later stages of this research.

AQUI HAY QUE PONER UN RESUMEN DEL NUMERO DE THEMES Y RELACIONES POR CATEGORÍA

The resulting a priori meta-framework contains the following key themes and relationships (Fig. 1):

5.4.1 Unit of analysis

In evolutionary systems, the unit of analysis represents the fundamental entity on which observations and analyses are centered. Historically, the focus has shifted over time, beginning with the organism—defined in biology as an individual living entity, such as a plant, animal, or microorganism, capable of independent existence and reproduction. Later, attention moved to populations, and with the advent of the modern synthesis, to genes.

When determining the unit of analysis in an evolutionary system, it is essential to distinguish clearly between the organism and the population as the primary focus of study. The individual organism represents a single living entity, while the population consists of a group of organisms of the same species, occupying a defined geographic area and sharing genetic similarities. The organism serves as the fundamental building block of the population, with its traits, behaviors,

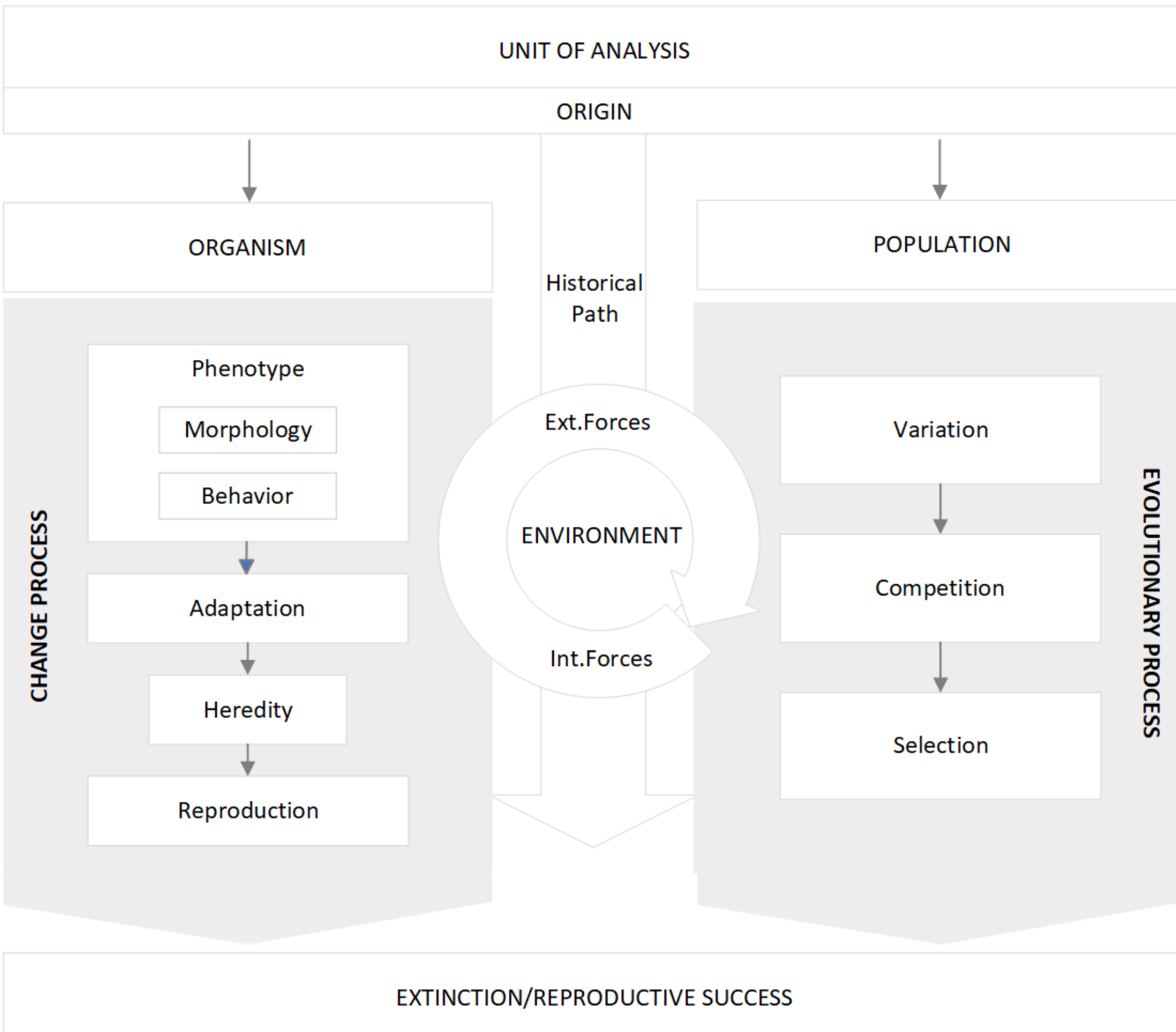

Figure 5.1: Fig1. The a priori meta-framework. Source: own elaboration based on Bowler (2009)

and adaptations shaping the broader dynamics of the population. As outlined in Darwin's theory, natural selection operates at the level of the individual organism, driving changes in the frequencies of traits within the population over time.

The choice of the unit of analysis significantly influences the scope and focus of evolutionary studies. Focusing on individual organisms provides detailed insights into microevolutionary processes such as natural selection and genetic drift. On the hand, analyzing populations allows for the exploration of macroevolutionary patterns and trends, including speciation and diversification, by examining collective dynamics and genetic variability within and between populations. In essence, while studying individual organisms sheds light on localized mechanisms of evolutionary change, focusing on populations offers a broader perspective on species evolution and adaptation over time. Together, both units of analysis are essential for comprehensively understanding the complexities of evolution within natural systems, as their interplay shapes the evolutionary trajectory of species.

5.4.2 Origin

The formation of populations from individual organisms fundamentally shapes the evolutionary trajectory of natural systems, making the study of individual origins a cornerstone of evolutionary analysis. Exploring the origins of individual organisms allows researchers to address essential questions about the emergence, diversification, distribution, and persistence of life forms on Earth. This inquiry involves examining historical evidence to uncover the mechanisms behind the origination and divergence of new species from common ancestors. Building on this foundation, evolutionary analysis can transition to exploring the trend of increasing complexity and the underlying forces that drive this progression.

The concept of "origin" is closely related to that of "generation" and "development processes". While the study of the "origin" focuses on the emergence of new entities in evolutionary systems, whether they are new individual organisms or entire species, "generation" refers to the processes by which life perpetuates itself over time through reproduction and inheritance, ensuring the continuity and variation necessary for evolution. Meanwhile, "developmental processes" involve the mechanisms that, beginning at the embryonic stage, shape the types of changes organisms can experience over time. Developmental processes guide how individual organisms grow, mature, and express their traits throughout their lifetimes. Together, these concepts address key mechanisms that shape the evolutionary trajectory of individuals and populations: how novel forms of life arise (origin), how they are perpetuated (generation), and how their traits are expressed and influence evolutionary potential (developmental processes).

5.4.3 Evolutionary vs change processes

Evolutionary processes encompass dynamic mechanisms that drive changes within populations across successive generations. Rather than acting solely on individual organisms, these mechanisms result in accumulated changes that are inherited within populations. Analyzing evolution at the population level reveals broad patterns of genetic variation, selection pressures, and speciation processes. Gene flow plays a crucial role by spreading advantageous traits and maintaining genetic diversity among populations. In contrast, isolation mechanisms, such as geographic or reproductive barriers, limit gene flow, fostering genetic differentiation and potentially leading to speciation. Natural selection operates on genetic variation, favoring traits that enhance survival and reproduction in specific environments. Meanwhile, genetic drift and mutation contribute additional layers of complexity, influencing population dynamics and shedding light on overarching evolutionary trends.

Change processes occur within individual organisms, whether phenotypic, behavioral, or genetic, often in response to environmental pressures and internal dynamics. When changes occur, they contribute to the genetic variation within populations. Natural selection acts as a guiding force, favoring traits that enhance survival or reproductive success in specific ecological niches. This selective process, influenced by environmental factors, shapes an organism's adaptation and survival chances. Over successive generations, advantageous traits become more common, while less beneficial traits fade.

The most comprehensive evolutionary approaches examine the interplay between individual-level changes and broader population-level processes. This integrated perspective clarifies how individual adaptations shape the overall evolutionary trajectory of species. By studying the relationship between individual-level changes and population dynamics, researchers can gain a deeper understanding of the mechanisms driving species evolution and adaptation in various ecological contexts.

5.4.4 Environment

The environment plays a key role in shaping evolutionary processes, as it provides the backdrop for how populations and individuals interact and adapt. In natural systems, the environment consists of both biotic and abiotic factors that influence species distribution, behavior, and evolutionary paths. Biotic factors refer to interactions among living organisms, such as competition for resources, predation, and symbiotic relationships. Abiotic factors, in contrast, include non-living elements like climate, geography, and physical resources. Together, these factors create the dynamic complexity of ecosystems, driving species to continually adapt for survival and reproduction.

In addition to these factors, evolutionary processes are driven by exogenous and endogenous dynamic forces, each having varying intensities and directional impacts. Exogenous forces originate from external sources outside individual organisms or ecosystems, such as climate fluctuations, geological events, and rare phenomena like asteroid impacts. These external influences can significantly affect habitats, species distributions, and evolutionary trajectories by altering environmental conditions and triggering evolutionary responses. In contrast, endogenous forces emerge from within organisms or ecosystems, or through interactions among organisms. Endogenous forces include genetic mutations, physiological responses, and ecological interactions within populations, all of which shape genetic compositions and population structures over time.

Environmental forces and factors are fundamental in shaping an organism's fitness, guiding natural selection, and determining evolutionary pathways. These elements drive species to evolve traits and behaviors adapted to their specific environmental niches, enhancing their survival and reproductive success. Working in tandem, they play distinct yet complementary roles. Environmental factors provide the foundational conditions and contexts for life, such as climate, habitat, and biological interactions, while forces actively propel changes within these contexts. Together, they create a dynamic interplay that is central to understanding evolution. Grasping this relationship is critical for uncovering the mechanisms behind species adaptation, biodiversity patterns, and ecosystem resilience.

The environment is also shaped by its historical trajectory. Past events, such as environmental disturbances and climatic shifts, leave lasting marks on ecosystems, influencing species composition, habitat availability, and biodiversity. Ecosystems with long histories tend to have greater biodiversity and genetic resilience, while disturbances may leave legacies that constrain adaptation. Incorporating historical perspectives into evolutionary analysis provides key insights into path-dependent processes, which are crucial for designing effective conservation strategies that strengthen ecosystem resilience.

5.4.5 Phenotypic traits

The structural and behavioral traits of individual organisms are central to the evolutionary dynamics of natural systems. Structural traits encompass physical characteristics such as morphology, anatomy, and physiology, which define an organism's form and function. These traits play a critical role in enabling organisms to adapt to their environments and interact with other species. Behavioral traits, in contrast, involve the actions and responses of organisms within their environment, including activities like feeding, mating rituals, communication, and social interactions.

The interaction between structural and behavioral traits influences the ecological niche that organisms occupy and determines their fitness within a specific environment. Organisms with advantageous traits have a higher likelihood of survival and reproduction, passing these traits on to future generations. This process drives the emergence, modification, or loss of traits, shaping an organism's adaptive strategy over time. By studying the morphological, physiological, and behavioral adaptations of organisms, researchers can uncover valuable insights into species strategies, the dynamics of ecological communities, and the co-evolutionary processes that shape biodiversity through generations.

5.4.6 Adaptation

Adaptation is a fundamental driver of evolutionary change at the individual level within natural systems. Organisms continuously modify their traits, behaviors, and physiological processes in response to environmental pressures. At its core, adaptation enhances an organism's fitness and survival within specific ecological niches. Through natural selection, individuals with traits that provide reproductive or survival advantages under prevailing conditions are more likely to pass on their genes. Over time, this process results in the accumulation of adaptive traits within populations, improving their overall fitness and resilience to environmental challenges.

Adaptation operates through various mechanisms, including phenotypic plasticity, genetic mutations, and behavioral changes. Phenotypic plasticity enables traits to adjust dynamically to environmental conditions, while mutations introduce new genetic variations. Behavioral adaptations improve resource utilization, predator avoidance, and reproductive success. Understanding adaptation at the individual level is key for uncovering the mechanisms that drive evolutionary change and species diversification. This knowledge can also illuminate how species develop adaptive strategies, the emergence of novel traits, and the evolving dynamics of ecological interactions over time.

5.4.7 Heredity

Heredity is the process through which genetic information is passed from one generation to the next, serving as a cornerstone of evolutionary processes. Encoded within DNA molecules, genetic material contains the instructions that guide an organism's development, growth, and functioning. Heredity operates through the replication and transmission of genetic material during processes such as mitosis and meiosis. This transmission, combined with mechanisms like genetic mutations and recombination, creates variation in traits among individuals within a population. Such variation is crucial for understanding the mechanisms driving evolutionary change, as it shapes species' diversity, adaptation, and persistence over time.

Heredity is intrinsically linked to reproduction, which ensures the transfer of genetic information from parents to their offspring. This continuity of genetic traits across generations provides the foundation for evolutionary change. Mutations and genetic recombination during reproduction introduce diversity within populations, which fuels natural selection and facilitates adaptation to shifting environmental conditions. Exploring the interplay between heredity and reproduction is therefore essential for understanding how individual-level changes contribute to evolutionary dynamics, revealing the processes that drive species evolution and adaptation in natural systems.

5.4.8 Reproduction

Reproduction is a fundamental process driving evolutionary dynamics at the individual level. Through the production of offspring, organisms perpetuate their genetic lineage and pass on hereditary traits, ensuring the continuity of life and preserving genetic diversity within populations. Both sexual and asexual reproduction contribute to this diversity, enriching the genetic pool and enhancing a population's adaptability. Factors such as mate selection, mating behaviors, timing, and reproductive success significantly influence the reproductive process, shaping the genetic composition and evolutionary direction of species.

Modern evolutionary theory highlights reproductive success as the key driver of natural selection, emphasizing the importance of transmitting genetic information to future generations. This focus has spurred extensive research into sexual selection, reproductive mechanisms, and the role of geographic barriers in species diversification. Understanding these mechanisms is thus vital for unraveling the complexities of evolution in natural systems. However, this perspective is not without criticism. Stephen Jay Gould, for instance, argued against an overly narrow focus on reproductive success as the sole driver of evolutionary change (2002). Ultimately, exploring reproduction at the individual level provides valuable insights into the adaptive strategies species employ, the preservation of genetic diversity, and the evolutionary forces shaping populations over time.

5.4.9 Variation

In evolutionary science, variation refers to the diversity of traits and characteristics within populations, influenced by both genetic and environmental factors. Variation provides the foundation for understanding phenotypic and genotypic differences within and among species. Variation is also central to competition and selection, as individuals possessing advantageous traits are more likely to survive, reproduce, and pass these traits to future generations. Over time, this differential reproductive success promotes the spread of favorable traits, driving evolutionary change.

A key source of variation is mutation, which introduces new genetic variants into populations. While most mutations are neutral, others can produce significant phenotypic differences, potentially offering advantages or disadvantages. The environment plays a critical role in determining which mutated traits are favored and proliferate within a population. Evolutionary analysis must account for this interplay between genetic variation and environmental pressures to fully understand how traits evolve and populations adapt.

5.4.10 Competition

Competition is a key driver of evolutionary dynamics within natural systems, arising when organisms compete for limited resources such as food, water, or territory. This pressure favors traits that provide a competitive advantage, leading to evolutionary changes and the inheritance of beneficial traits by subsequent generations. Within populations, competition takes various forms: direct competition for resources, interference competition involving aggressive interactions, and exploitative competition where one organism outcompetes another by more efficiently utilizing shared resources. These interactions often drive niche differentiation, where species adapt to partition resources, reducing direct competition and enabling coexistence within the same habitat.

Competition also fuels evolutionary innovation and adaptation, pushing species to develop traits and behaviors that provide a competitive edge. This process can lead to species diversification and the evolution of complex ecological relationships over time.

Ultimately, competition lays the foundation for natural selection, enabling the accumulation of adaptive traits while diminishing the prevalence of less advantageous ones. Understanding the dynamics of competition is critical for exploring species interactions, community dynamics, and evolutionary pathways in ecosystems. By examining these interactions, evolutionary analysts gain valuable insights into the forces shaping biodiversity, ecological resilience, and the stability of natural systems.

5.4.11 Selection

Selection mechanisms operate on the diversity of individual units, favoring traits that provide competitive advantages and enhance survival. Selection processes are fundamental drivers of evolutionary change. Among them, natural selection is a primary mechanism, favoring traits that increase an organism's fitness and reproductive success in its environment. Individuals with advantageous traits are more likely to survive and reproduce, passing their genetic material to future generations. Over time, this differential reproductive success results in the accumulation of beneficial traits within populations, enabling adaptation to changing environmental conditions.

However, although natural selection is a cornerstone of evolutionary theory, selection operates through various mechanisms, including directional selection, stabilizing selection, and disruptive selection. Directional selection shifts traits towards one extreme, stabilizing selection maintains the status quo within a population, and disruptive selection leads to divergence. Understanding these selection processes is crucial for elucidating the mechanisms driving evolutionary change and biodiversity within natural systems.

Selection operates through multiple mechanisms, each influencing evolutionary trajectories differently:

- **Directional selection** pushes traits toward one extreme, favoring a specific adaptation.
- **Stabilizing selection** preserves the current state, maintaining traits that are already well-suited to the environment.

- **Disruptive selection** favors extreme traits at both ends of the spectrum, often leading to divergence within a population.

Each type of selection represents a distinct pathway that drives population adaptation and evolution over time. Understanding these processes is therefore important for revealing how evolutionary change occurs and for explaining the development of biodiversity within natural systems.

5.5 Systematic Literature Reviews

5.6 Final Meta-Framework

6 Discussion

The framework we have described categorizes the engagement of participants in research agenda setting in terms of the types of people involved, the degree of public involvement, and the initiators of the engagement. It combines and extends concepts proposed by Arnstein9 and Mullen et al.12 The framework is consistent with an eight-dimensional framework described by Byrt and Dooher. Oliver et al. (2008)

Our review findings provide some answers to Boote et al.Õs questions7: how can public involvement be conceptualized; how and why does public involvement influence health research; and what factors are associated with success?. Oliver et al. (2008)

In many ways our analysis drew similar conclusions to research addressing public participation in health services. We found that lay (...) Oliver et al. (2008)

Particular success has been achieved by a research agenda setting exercise that addressed the key dimensions of the framework by com- bining the benefits of representative consultation with iterative collaboration and explicit decision making.64 Acomprehensive evaluation of process and outcome concluded that the (...) Oliver et al. (2008)

Our framework has been since used in a systematic review of involvement in a broader range of activities: developing health-care policy and research, clinical practice guidelines and patient information.65 Use of the framework in this review ensured that different methods of involvement were described in comparable terms, and it enabled the review to highlight areas where no evidence was available at all. The review showed clearly that no trials to date have evalu- ated different degrees of involvement, different forums of communication, lay involvement in decision making, or the provision of training or personal or financial support for lay involvement. Oliver et al. (2008)

The SEARCH framework has been developed as a tool to support future research and practice in positive education and to help overcome (...) Waters and Loton (2019)

SEARCH is a data-driven, multidimensional and actionable framework, comprising six evidence-based pathways to foster wellbeing. The higher-order nature of these path- ways provides a comprehensive and integrated focus whilst still (...) Waters and Loton (2019)

To further establish the utility of SEARCH for school students the current review paper examined whether the existing evidence from published positive education interventions mapped on to the six pathways. Eighty-five peer-reviewed intervention studies were identified that had tested the *effects of each of the SEARCH pathways on students. The interventions were tested in school students ranging from ages (...)Waters and Loton (2019)*

The intervention studies showed a consistent pattern of evidence that each of the six pathways can be effectively targeted to improve wellbeing and academic outcomes, although tests of efficacy were not universally significant. Positive(...) Waters and Loton (2019)

6.1 Substantive findings / 6.2 Strengths and limitations of the review / 6.3 Methods of primary studies / 6.5 The context of previous 'views' research / 6.6 Policy context Brunton et al. (2006)

6.1 Using SEARCH as a Meta-Framework to Guide Future Research

We offer SEARCH as a useful framework to help researchers scaffold and build the science of positive education. For example, when researchers are designing and/or evaluating (...) A positive consequence of this is that it may create greater connections amongst researchers and foster stronger cross-pollination across topics when pulled together by an overarching framework like SEARCH. Waters and Loton (2019)

One potential avenue ofresearch using SEARCH may be in developmental psychology where the framework can be used to create an age-stage appropriate scope and sequencing of wellbeing curriculums. In addition, research may also show that certain pathways are needed to be developed earlier than other pathways in certain ages (...) Such developmental questions on how to best build wellbeing over time can be scaffolded by using the SEARCH meta- framework.@waters2019search*

6.2 Gaps in Positive Education Research

The current review of existing positive education literature has identified a number of gaps that can be addressed through future research. First, (...) Waters and Loton (2019)

Another gap identified in this review paper is the disparity of research conducted between the six pathways in positive education interventions (...) Waters and Loton (2019)

Finally, this review points towards the need for more RCT designs to be used when testing the effectiveness of positive education interventions (...)Waters and Loton (2019)

One untapped area for future research is the effect of context and where and how the interventions are delivered. In the current review, the bulk of the interventions were (...)Waters and Loton (2019)

6.3 Using SEARCH as a Meta-Framework to Guide School Practice

Waters and Loton (2019) **Note: meter aquí el archivo de "Implications"**

SEARCH is not only an evidence-based framework to guide research in the field, it is also a framework that can guide practical application in schools, something that White and Kern (2018) highlight as being ofcentral importance.We offer SEARCH as a framework to assist schools when implementing positive education interventions in a co-ordinated manner across different year levels and across all areas of the school (...) Waters and Loton (2019)

SEARCH provides a data-driven, action-research informed framework for teachers to use when designing positive education interventions. Educators are encouraged to think not only about the content ofthe intervention but how that intervention can be used to build one or more of the higher-order pathways ofwellbeing. For example, while (...) Waters and Loton (2019)

Beyond the design ofindividual positive education interventions, SEARCH can be used to design larger wellbeing curriculums. Such curriculums can teach students how to (...) Waters and Loton (2019)

School leaders and administrators can find strategic and consistent ways to infuse SEARCH into elements of the school that impact faculty and staff such as recruitment and selection, performance development, professional learning, employee wellbeing programs and staff/faculty room culture. A key question for school leaders prompted by the SEARCH framework is 'How can I intentionally create a culture that fosters strengths, emotional management, attention and awareness, relationships, coping and habits and goals for all the adult members of the school?Waters and Loton (2019)

6.4 The Use of a Synthesis Method

There are arguments about whether it is feasible or acceptable to conduct syntheses of qualitative evidence at all,41 and whether it is acceptable to synthesise qualitative studies derived from different traditions. The distinctions, tensions and conflicts between these have been vividly described.@dixon2005synthesising

Perhaps even more likely to generate controversy are attempts to synthesise qualitative and quantitative evidence. It is evident from the discussion above that synthesis of diverse forms of evidence will generally involve conversion of qualitative data into quantitative form or vice versa. Dixon-Woods et al. (2005)

Should reviews start with a well-defined question and how many papers are required? The issue of questions is an important one for syntheses. It will be clear that the methods described above will be more suited to some questions than others: for example questions concerning causality may be better suited to qualitative comparative analysis than questions concerned with the production of mid-range theory, which might be better suited to meta-ethnography. The *issue of how questions should be identified and formulated in the first instance is one on which there is much uncertainty.*

Estabrooks et al, like many in the systematic review community, argue that review questions should be selected to focus on similar populations or themes.43 However, others point out that in primary qualitative research, definitions of the phenomenon emerge from the data.15 Whether one should start with an a priori definition of the phenomenon for purposes of a secondary synthesis is therefore an important question.@dixon2005synthesising

A related issue is how to limit the number of papers included in the review. One approach is to narrow the focus. An alternative strategy is offered by theoretical sampling, used in primary qualitative research with a view towards the evolving development of the concepts. Sampling continues until theoretical saturation is reached, where no new relevant data seem to emerge regarding a category, either to extend or contradict it.45 It has been suggested that this approach would also be suitable for selecting papers for inclusion in reviews.46–48 However, the application of this form of sampling has been rarely tested empirically, and some express anxiety that this may result in the omission of relevant data, thus limiting the understanding of the phenomenon and the context in which it occurs. Dixon-Woods et al. (2005)

Appraising studies for inclusion The issue of how or whether to appraise qualitative papers for inclusion in a review has received a great deal of attention. The NHS CRD guidance emphasises the need for a structured approach to quality assessment for qualitative studies to be included in reviews, but also recognises the difficulties of achieving consensus on the criteria that might constitute quality standards.5 Some argue that weak papers should be excluded. Others, however, propose that papers should not be excluded for reasons of quality, particularly where this might result in synthesisers discounting important studies for the sake of 'surface mistakes', which are distinguished from fatal mistakes that invalidate the finding.Published examples include reviews that have chosen not to appraise the papers,14 as well as those which have opted to appraise the papers using a formalised approach.22 If the argument prevails that some quality appraisal is necessary, the problem then arises as to how this should be undertaken. Dixon-Woods et al. (2005)

Conclusions There is an urgent need for rigorous methods for synthesising evidence of diverse types generated by diverse methodologies. These methods are required to meet the needs of policy-makers and practitioners, who need to be able to benefit from the range of evidence available. Dixon-Woods et al. (2005)

6.5 Practical Implications

6.5.1 Evolutionary analyst

One of the practical benefits derived from the present proposal of formulating an evolutionary systems analytical framework is to determine the need to have professionals with an evolutionary analyst profile. An evolutionary analyst is understood to be an academic or professional who has a clear and deep understanding of the evolutionary functioning of systems and who is capable of using rigorous analysis and tools to determine the factors that explain their essence and elements of change.

6.5.2 Prediction ability

If we are able to acquire a deep understanding of the functioning of the evolutionary system, its components, behaviors and flow of changes, we can then better foresee in which direction the evolutionary system is moving and glimpse whether the system has the capacity to survive or, on the contrary, is doomed to disappearance.

It is worth considering the possibility of whether, based on increasingly deeper knowledge of the evolution of a system, it would be possible to act on the future of the system. In other words, if it could be feasible to design your own plan and carry it out based on the knowledge generated about the evolution of the system.

To what extent is the system under observation random in change or does it evidence a logic that can be known and even altered based on our desires or needs?

6.5.3 Manipulation of the system and its programmability

If they were really able to manipulate the system as we wish, on what elements would it be most feasible to do so? Would it be possible to act on both the structural and behavioral elements, only on one of them? Being able to act on a known evolutionary system would open new and great opportunities to design systems that meet a wide diversity of needs.

The above would necessarily entail having to assess the ethical problems of altering the course of nature and the new problems that would emerge by distorting the natural mechanisms of the functioning of life and society. The opposite position would be to conclude that the system is unalterable and we cannot intelligently design it to satisfy our desires.

Society would go from a stage in which social systems are considered elusive to another in which we would be able to know to what extent their evolution is random, to what extent there is causality and to what extent they are programmable.

6.5.4 Inform and activate policies

An evolutionary analysis framework can serve to inform who cannot support themselves, namely, who is more likely to survive and continue competitive, and who is threatened by disappearance.

Identifying who dominates over whom, that is, elucidating the relationships and power structures has great significance, but it is also a way to understand how species advance. In fact, the process of replacement or extinction of species is an essential aspect to understand human progress.

The level at which the analyst expects to inform policy, or the level of contribution expected by decision makers from an evolutionary model, is a factor in determining the level of analysis to be used in the "struggle for existence."

Additionally, if education (education policies) could improve individuals, the benefits could perhaps be passed on through inheritance (this is a Lamarckian view).

6.5.5 Overcoming the barriers that prevent systematic struggle

From the RQs: Another question that the evolutionary analyst can try to resolve is whether the individual **permits the struggle** to take place and, if not, to what extent this weakens the individual and, therefore, that the individual enters into a process of degeneration that leads to a replacement by another individual.

This leads us to the recommendation, in some circumstances mediated by policies, that the struggle does not have constraints that condition it. Thus, as the environment continues to pose challenges that must be faced (resolved) by the individual, progress will continues.

6.5.6 Eugenics of individuals

The above leads us to the problem of eugenics, and the reflection on to what extent the system must ensure that the selection produces and there are no barriers for it to unfold its effects.

6.5.7 The connection with complex systems

The analysis of evolutionary systems demonstrates a connection with complex systems, such that species should be seen as complex systems with an enormous amount of variation, stimulated by selection.

6.5.8 The contribution of this review to policy

The key message from this systematic review is that interventions will not work unless public views about the value, safety, benefits and costs of walking and cycling are taken into account. This information will thus be of interest to parents and children, government policy-makers at the national and local level, schools, and research funding bodies. Policy-makers need to understand that perceived safety is a key influence on walking and cycling, but that environmental improvements and facilities can encourage a shift away from car culture.@brunton2006synthesis

6.6 Framework Thematic Discussion

6.6.1 On Evolution

When addressing the study of an evolutionary system, it is of paramount importance to first elucidate what **the unit** of the system will be, on which the entire conceptual and methodological apparatus of evolution will be applied. This is a discussion that has changed over time, having moved from the individual organism to what is currently considered a more correct approach, the gene. What the above means is that instead of prioritizing "adaptive fitness" in the analysis, today it seems more appropriate to focus on the reproductive success of the individual. This new perspective has given rise to the movement of ultra-Darwinism.

The analysis of evolutionary **stratigraphy**, that is, the analysis of the evolutionary process cut into layers, can provide valuable evidence and insight about the evolution followed by each stratum, as well as the relationships that exist between strata. Additionally, it may also be valuable to study the global stratigraphy of the system, that is, the system of layers resulting from aggregating lower-level strata into higher-level strata, since this can suggest new stratal relationships that previously remained hidden from view of the evolutionary system.

The geological **law of superposition**, which states that in any sequence of undisturbed sedimentary rocks, each layer of rock is younger than the one below it and older than the one above it, can be used analogously in the analysis of an evolutionary system, thus establishing that each lower layer manifests a behavior on which the behavior of the upper layer is based.

6.6.1.1 Hierarchy

The idea of hierarchy involves something on top down to somethinge else.

Once the evolutionary system has been sliced into strata and the evidence that each one individually provides, as well as that of the global stratigraphic system, has been analyzed, the evolutionary analyst will be able to infer the **hierarchical structure** of evolutionary elements that characterize the system under observation.

6.6.1.2 Classification

A classification or taxonomy is a procedure used to better understand the diversity (and variation) of organisms.

When studying the evolution of a population, building a **classification or taxonomy** of units (species) becomes relevant. This requires discipline and deep analysis into the building blocks and the relationships (or degrees of relationships) that stand between individuals. By formulating a classification/taxonomy, new avenues can be opened that allow the evolutionary analyst to trace (and understand) the past of the units and make it easier to foresee the next steps that the unit will go through.

With a classification or taxonomy the analyst can study the diversity of the units (species) based e.g. in their morphology, as well as the ecological relationships that exist between them.

In the history of evolution, three major frameworks for classifying species are usually proposed:

1. Chain of being (Bonnet) -> it is a hierarchical chain of relationships
2. The rope of being (Rubinet)
3. Lineo taxonomy based on visible resemblances (with no hierarchy)

6.6.1.3 Miscelaneous

The idea of the extent to which the **history of "life"** has been progressive but in an irregular way.

The idea of **"emergent evolution"** (Lloyd Morgan) which highlights the new high-level properties that appear as evolution reaches a certain level of complexity.

6.6.2 On the Origin

The idea of the Origin is consubstantially associated with the idea of an **end**, since everything that begins must necessarily have an end.

The problem of origin is closed related to the **problem of generation**, thus the evolutionary analyst must elucidate whether the origin of the unit is spontaneous, preformationist, etc.

An alternative perspective to the problem of origin can be raised from **biogenesis** (life arising from non-living matter) and the **"primordial soup"** (Opsin), that is, the combination of elements that gives rise to the synthesis of compounds " organic" after adding energy to the system (from lightning, UVA radiation, volcanic activity, etc.)

6.6.3 On the Environment

6.6.3.1 On the Forces

We do not know the forces (and their sources) that operate driving the process of change in the individuals of a population.

Apart from the forces that operate at the level of individuals, it is necessary to know what the transmission mechanisms are like from the environment to the individual, between individuals, and vice versa, from the individual to the environment.

What is the materiality of the pressure for change exerted by an environmental force?

6.6.3.2 On Selection

One of the most difficult questions that every evolutionary analyst must face is how the **selection process** imposed by the environment actually work, and to what extent different alternative selection approaches can help explain the evolutionary course of the system.

We refer to the selection process not as the blind application of a closed paradigm that we know a priori will provide an explanatory response to the evolution of any system, but rather the analyst evaluates to what degree alternative selection models can provide insight into our understanding of the evolution of the system. It is about better understanding how rival visions can have a place in our understanding of the evolutionary phenomena of the system, even in an open and simultaneous way.

6.6.4 On the Unit

6.6.4.1 On the Structure

6.6.4.2 On the Behavior

To what extent is the system's behavior governed by inherited **instincts**? And to what extent can the selection process alter instincts? Are instincts constraints to the development of behavior and the process of change, or are they not such constraints?

What behavioral traits can be considered **innate** and which are constructed with the interaction with the natural and social environment? What are the environmental stimuli that might help explain the individual instincts?

Perhaps the analyst, in addition to (the above) behavioralist approach, might approach the analysis of the behavior by exploring the internal processes inside the individual that trigger observable responses in the individual.

Can individual behavior be **predicted**? Furthermore, can behavior be controlled by manipulating the environment and creating a stimulus-response association in the individual? The evolutionary analyst might also focus on how the individual learns through the association of stimuli with specific responses.

To what extent can **learning** and **technology** affect instincts to the point of making them heritable?

The problem of **hierarchy** can also affect behavior to the point that the evolutionary analyst can try to elucidate what the behavioral hierarchy is (e.g. intellectual, social, moral, etc.). How are these behavioral faculties created?

It is important for the evolutionary analyst to assess to what extent there is the possibility that we have the ability to **control genes** and, therefore, that we can control how human behavior can be controlled (The Blind Watchmaker- R.Dawkins)

6.6.5 On Change

We know what an individual is today, but we do not know how an individual became what it is today. This necessarily raises the need to study the **historical past** as a source of knowledge to understand the process of change or evolution followed.

If change does not leave any **proof** (of evolution), why don't we seek indirect progress (i.e. the equivalent of fossils)?

It is necessary to know which components of the individual's structure (or flows) the **forces of the environment** act on, or on which behaviors the forces of the environment have an impact.

Also relevant is the question of how the **development process** of an individual is like, both before conception (embryonic development) and during its life period.

Does the change caused by forces in the environment respond to any **goal or objective**? Is there any direction, goal or trend? And if there is one, what is the justification for it to exist? Is there any type of constraint associated with the development of the individual that conditions or limits the process of change? Can we rule out that the individual's process of change does not have a teleological character (e.g. a guiding principle, a force, etc.) towards a specific end/goal?

In the analysis of **evolutionary dynamics**, it is interesting to know if the system becomes stable and in equilibrium, stable and not in equilibrium. Finding out this situation allows us to better understand the nature of the evolutionary process and try to predict the next steps in the evolution of the system.

What are the **change mechanisms** used by units to respond to environmental forces? Some may be:

1) Hybridization
2) Recombination
3) etc.

To what extent is the **timeline** for the adoption of changes a key factor that determines the individual results of the change? When analyzing change it is key therefore key to elucidate the timeline in which it unfolds.

Speaking about the timescale of the change processes, it is interesting to find out if the system is constrained by certain structural limitations, or that they have their origin in its own development, and that explain why the changes occur. This would allow the evolutionary analyst to estimate the particular evolutionary **"clock"** of the system. The idea of the clock is to explain traits that evolve at a constant rate overtime, due to underlying molecular mechanisms. In other words, that would explain the rate of change at which changes accumulate over time.

It is evident that the clock idea would not offer precise information similar to that currently used in the field of molecular biology or genetics to provide insight into the the tempo and mode of evolutionary change, but it could be a qualitative approximation to the temporal factors that intervene in the rate of evolution of a system.

A possible model that explains the evolutionary process that should be seriously taken into account is known as **punctuated equilibria"**. According to this model, species remain relatively stable and in equilibrium with their environment for long periods of time. During this time they register small changes in their morphology or level of adaptation. However, at certain times, sudden changes occur that trigger evolutionary episodes of changes (punctuation) associated with events that are accompanied by speciation. These periods of rapid change would be interspersed with long periods of stasis.

The evolutionary analyst should open to the notion of **arrow of time**, and the preferred direction or sequence of change. And if the change process is reversible vs irreversible (with higher entropy). In turn, this should lead the analyst to consider the predictability or unpredictability of evolution.

Is the result of evolution the same system of a new one?

6.6.6 On Heredity

What are the limits of heredity (change)?

7 Theory

- The concept of evolutionary frameworks in the economics/firm/business literature
- Reviews of framework studies

The following section combines several of these aspects, to provide a 'meta-framework' for evaluating STI frameworks.

7.1 Natural Science as the Cornerstone of Evolutionary Inquiry

The study of evolution in the natural sciences serves as a foundational pillar for understanding evolutionary phenomena across various disciplines due to its fundamental principles and overarching explanatory power. Evolutionary theory, rooted in biology and natural selection, elucidates the mechanisms driving change and adaptation in living organisms over time. These principles extend beyond biology, providing insights into the dynamics of change, adaptation, and innovation in diverse systems, including social, economic, and cultural domains. By examining how species evolve and interact within their environments, evolutionary science offers valuable analogies and frameworks for understanding analogous processes in other disciplines. Consequently, evolutionary concepts serve as a unifying framework, facilitating interdisciplinary research and fostering a deeper understanding of complex phenomena across different fields. Thus, the study of evolution in the natural sciences not only enriches our understanding of biological systems but also provides valuable insights into the dynamics of change and adaptation in broader contexts.

7.2 What is a Framework?

At a general level, in this paper a framework is understood as an abstraction: a type of mental and communicative construct to help build a coherent world view. A framework is not always visible to the user, but a framework for the use of indicators in a decision making context should be designed in a conscious, communicative process (15). Assmuth & Hildén (16) define frameworks as "the conceptual and procedural constructs that assimilate, process, and give meaning to information". This definition highlights two dimensions to help frameworks do precisely this: 1) the 'conceptual' dimension that aims to capture the substance or essence of what is to be measured and elucidated (for example, frameworks to measure 'sustainability' *organized in the Triple Bottom Line (TBL) domains), and 2) the 'procedural' or 'operational' dimension, which refers to more practical concerns – who needs to do what to collect, produce and report the required information? A third important dimension not highlighted by Assmuth and Hilden's definition concerns the purpose of the information, what is termed hereon the 'utilization' function. Cornet and Gudmundsson (2015)*

7.3 What is the purpose of a Meta-Framework?

A meta-framework is understood as an overarching frame for what should inform the analysis and eventually the design of STI practice frameworks, meaning frameworks used by or provided for transportation policy and planning bodies to select and apply indicators for sustainable transportation. The meta-framework is not a general theory, nor a master framework to be adopted directly by agencies, but a classification and evaluation device. It should, above all, allow for a structuring of the empirical analysis of frameworks adopted by agencies in practice. Such analysis will review how the conceptual, operational and utilization functions of a case framework are performed, and how the most important criteria for each function are fulfilled. These criteria should allow a comprehensive analysis of the strengths and weaknesses of different practical frameworks with regard to how well they manage to connect sustainability theory to action.@cornet2015building

8 Conclusion

The evolutionary analysis of systems fundamentally requires generating much more extensive and precise knowledge about individuals and populations, as well as about the periods and places in which they develop. This is self-evident when it comes to obtaining a deeper understanding of the reasons for change and diversity.

We also know today that systems do not evolve smoothly and continuously over long periods of time but do so based on pulses between periods of interruption that cause disruptive changes and the mass extinction of units.

Knowing the sequence of events that have shaped the evolutionary processes opens new analytical dimensions to the study of the evolutionary phenomenon and allows us to confront elements considered unpredictable until now in the course of evolution.

It is certainly an exciting time for the field with the rapid expansion of science and practice. However, this growth has put positive education at risk of lacking a cohesive direction and of failing to build the cumulative evidence needed to advance the field.@waters2019search

In this paper we have argued that a meta-framework can prevent these risks by providing higher-order parameters that help us to guide future research and practise in ways that ensure more consistent, integrated, cohesive and perhaps even synergistic outcomes. The SEARCH framework, developed from a large-scale bibliometric analysis of the field combined with action research has been supported through a systematic review of evidence in the current paper which has shown that schools can build up each of the six pathways through interventions in and out of the classroom.@waters2019search

We offer this framework to our colleagues in the field and hope it is used far and wide to build rigorous research and reliable practices that help positive education to achieve the dual purpose put forward by Seligman et al. (2009) of boosting wellbeing and academic outcomes.@waters2019search

This review of involving the public in research agenda setting builds on the technique of framework analysis which has previously been described only for primary research.6 We found this approach useful for developing a conceptual framework of public involvement in research based on accessing and reviewing a broad literature. Our framework is consistent with analyses in the literature about empowerment for public involvement in public services more broadly. It is potentially applicable to a wide range of reports of public involvement in research and research-based activities. Use of the framework facilitates learning from many different strategies and reports of these, from informal reflections to formal research. Such a breadth can thus *generate an overview of achievements to inform policies and practices in the area of public involvement in research. As with other systematic review methods, application of the framework also usefully identifies gaps in the literature which need to be filled in order to increase our understanding of how to promote public involvement and evaluate the effectiveness of different approaches.@oliver2008multidimensional*

8.1 Recommendations

We need more good quality research on interventions for particular social groups. Nonetheless, it is possible to derive a number of recommendations from the work described in this report. They are grouped into recommendations for developing future effective and appropriate interventions, systematic reviews, and views studies.@brunton2006synthesis

Type of recommendations: Recommendations for developing effective and appropriate interventions / Recommendations for future views studies / Recommendations for future systematic reviews. Brunton et al. (2006) The

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