

# **EVOLUTIOSoc: A Meta-Framework for Complex Social Systems**

Francisco J Navarro-Meneses

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# Abstract

This paper presents a data-driven, meta-framework to support evidence-based decisions for researchers and practitioners when designing, investigating and implementing social complex systems: the EVOLUTIOSoc framework.

EVOLUTIOSoc was developed through a two-stage process.

Stage one comprised the thematic grouping of topics based on a seminal evolution history work. Stage two involved testing the framework and fine-tuning it with selected works in evolution, both from the field of biology and the social sciences.

*Stage one comprised a large-scale bibliometric review and thematic grouping of topics based on natural language processing of over 18,403 positive psychology studies.*

*Stage two involved action-research with ten schools testing the practical validity of the wellbeing themes identified in stage one with educators.*

The **result** of these two stages identified six overarching pathways to wellbeing that formed the SEARCH framework: 1) strengths, 2) emotional management, 3) attention and awareness, 4) relationships, 5) coping and 6) habits and goals.

The **aim of this current review paper** was to examine the existing educational and psychology literature for evidence of whether each SEARCH pathway has been found to successfully foster student wellbeing. Seventy five peer-reviewed studies (total student N= 35,888) were reviewed from North America, Europe, the United Kingdom, Asia, Australia and New Zealand.

**Results** demonstrate the value and applicability of the SEARCH framework. The comprehensive review conducted in this paper is then used to discuss current gaps in positive education research as well as present the utility of SEARCH as a framework to support positive education science and practice.

*The review of views studies concludes that children's, young people's and parents' views about what helps and hinders their walking and cycling involves the strong culture of car use, the fear and dislike of local environments, children as responsible transport users, and parental responsibility for their children. Brunton et al. (2006)*

*The CEN Workshop Agreement (CWA) first presents an in-depth analysis of the current state-of-the art of ICT Practitioner Skills/Competence frameworks in order to clarify the nature of the next steps towards a European ICT Skills Meta-Framework, and its relationship to the*

*proposed European Qualifications Framework (EQF). Then, recommendations based on the results of the analysis are presented.*@de2006european

*A comprehensive overview of ICT frameworks has been produced, and a structured inventory of five particularly significant ICT Practitioner Skills/Competence frameworks is presented, in terms of a number of key attributes. Three specific frameworks, representing the national approaches in three large Member States, are analysed in some detail, and certain findings are evident, based on their mutual similarities and differences. The overall structural paradigm and an example comparable profile for each are examined. European Committee for Standardization (2006)*

*A structured review of four significant ICT Practitioner Frameworks (the three major national frameworks in the EU and one from North America) was carried out and is presented, and Level Descriptors for the specification of ICT Practitioner competence are developed from the generic EQF descriptors. In addition, based on the comparisons of existing frameworks, broad Guidance is provided for appropriate and effective use and further development of such frameworks. European Committee for Standardization (2006)*

*An “Ideal Scenario” is presented, aiming to introduce the potential benefits of greater coherence at the European level, and options are shown for possible ways of moving towards that world. It is recognized that there is a need for stronger evidence of benefits in relation to the different uses of such frameworks, and a set of recommendations for progressing increased coherence are made, in relation to both ICT Practitioner competence Frameworks and ICT Qualifications of different types.*@de2006european

*The in-depth analysis of a range of evidence leads to the following conclusions: - It is recommended to encourage and strengthen the process of convergence of ICT Practitioner skills/competence frameworks within the EU by means of a three step process:European Committee for Standardization (2006)*

**Keywords:** Evolutionary analysis, meta-synthesis, framework, complex systems, social science

# 1 Introduction

Title: Evolution in the SOcial Sciences/ Theory of the Firm

*0. Introduction / 0.1 Background / 0.2 Purpose of the European ICT Skills Meta-Framework  
European Committee for Standardization (2006)*

*A Meta-Framework is one which stands beyond (or above) (other) frameworks, in the sense of describing (other) frameworks. A Meta-Framework is a framework about frameworks. There are a number of existing frameworks for ICT Practitioners within the EU and beyond, and the proposed Meta-Framework would “stand beyond” them in particular because it is not intended, or designed, to stand alongside them. It is not a “new” ICT Practitioner Skills/Competence Framework, but attempts to encompass and disseminate information about existing (and possible future) such frameworks, for the benefit of all.*@de2006european

*Better understanding about ICT Skills can be useful in a number of ways, but extensive discussions as part of the Workshop process have concluded that the greatest value from this Meta-Framework can be gained from its use as:*

- *a tool for structured comparison between existing ICT Practitioner Skills/Competence Frameworks;*
- *a guidance resource on which those considering the possibility of developing their own Frameworks can draw;*
- *a conceptual basis for planning future developments that would help assure a greater supply of competent ICT Practitioners to European employers; and*
- *a starting point from which the proposed European Qualifications Framework can be applied to, and evaluated for, ICT Practitioner work, both by employers and by practitioners planning their careers.*@de2006european

*Just as Information and Communication Technologies themselves are highly complex and continuing to evolve, so the skill-sets needed in relation to deploying and using ICT are both very complex and not yet stable or mature in terms of coherence of their classification. As a result, efforts to clarify and codify the structures of these skills have not yet reached a level of stability that enables adequate agreement at the European level on classification frameworks that could be thought of as a possible future standard for the European Union.*@de2006european

*The need for such a review was recognised in light of an effectiveness review of interventions promoting a shift away from car travel towards more active modes of transport, the ‘modal shift’ review (Ogilvie et al., 2004). This found equivocal evidence of effectiveness for population-level interventions that promote walking and cycling as alternatives to car use (...) Synthesising views studies and effectiveness studies together can lead to more specific recommendations for*

*developing interventions, choosing which to evaluate rigorously, as well as which to implement as policy. Brunton et al. (2006)*

*Synthesising these findings with the ‘modal shift’ review’s effectiveness findings identified some interventions that are appropriate and effective; and some that may be promising either because they appear effective in some studies, but not others, or because they complement people’s views, but have not been rigorously evaluated for their effects. Effective interventions to be adapted for wider use include social marketing, with and without the development of cycle networks.@brunton2006synthesis*

*Studies of people’s views have several implications for intervention. The most important is the need to reduce the convenience of car travel and simultaneously increase the safety of pedestrians and cyclists in residential areas and around schools. According to the research evidence, this would encourage children, young people and parents to walk and cycle, and to use public spaces more, which would strengthen overall community environments.@brunton2006synthesis*

## 1.1 History

The concept of evolution, in the sense of a gradual development or change over time, has been a subject of contemplation and inquiry for civilizations throughout history. While ancient civilizations may not have had access to the scientific methods and knowledge that underpin modern evolutionary theory, they did observe and speculate about patterns of change in the natural world. For example:

1. **Ancient Greece:** The ancient Greek philosophers contemplated the origins and development of life, the diversity of species, and the process of change in the natural world, proposing early ideas that laid the groundwork for later theories of evolution. The pre-Socratic philosopher Anaximander proposed a theory of evolution where life originated from a primordial substance, the “apeiron”, which evolved over time through a process of spontaneous generation and transformation. He speculated that simpler forms of life gave rise to more complex organisms, anticipating the idea of a progression or development of species. Almost one hundred years later, Empedocles in his *Theory of the Four Elements* proposed that all matter was composed of four fundamental elements - earth, air, fire, and water. He suggested that living organisms arose from combinations of these elements, hinting at a process of transformation and change over time.
2. **Aristotle (384 – 322 BCE):** Aristotle proposed a scala naturae (Great Chain of Being), which depicted a hierarchical order of existence with all living beings arranged in a graded scale from simple to complex. While not a theory of biological evolution, Aristotle’s ideas influenced later thinkers and shaped medieval and early modern views of nature. Atomist philosophers such as Leucippus and his student Democritus proposed a materialistic view of the universe, suggesting that all phenomena could be explained in terms of interactions between atoms. While their ideas differed from modern evolutionary theory,

their emphasis on naturalistic explanations contributed to humanity's ongoing quest to understand the origins and development of life on Earth, and opened the possibility of variation and change in living organisms.

3. **Ancient India and China:** Ancient Indian and Chinese philosophies also explored ideas related to the origins and development of life. For instance, Hindu and Buddhist cosmologies include concepts of cyclical time and reincarnation, which imply a process of change and evolution, and they are early attempts to understand the natural world and humanity's place within it. While not explicitly addressing biological evolution, Daoist texts such as the "Zhuangzi" and the "Dao De Jing" contained passages that reflected a cyclical view of time and the continuous transformation of the natural world. Central to the Chinese cosmology is the Yin-yang theory, which posited the dynamic interplay between opposing forces. This concept of balance and change informed Chinese views of the natural world, including notions of growth, decay, and cyclical renewal. While early Buddhist texts did not discuss biological evolution, the idea of continual change and the cycle of birth and rebirth suggested a broader understanding of evolutionary processes. Hindu cosmology, as outlined in texts such as the "Puranas" and the "Bhagavad Gita," described cycles of creation, destruction, and rebirth spanning vast epochs of time. The concept of "yugas" or cosmic ages implied a process of change and evolution within the universe.
4. **Islamic Golden Age:** During the Islamic Golden Age, scholars like Al-Jahiz in the 9th century proposed a rudimentary form of natural selection in his work "Kitab al-Hayawan" (Book of Animals), where he speculated about how organisms compete for resources and adapt to their environments, suggesting that those best suited to their surroundings are more likely to survive and reproduce. Muslim philosophers such as Al-Kindi, Al-Farabi, Avicenna (Ibn Sina), and Averroes (Ibn Rushd) engaged in philosophical speculation and inquiry, drawing upon Greek, Persian, and Indian sources. They explored concepts such as the eternity of the universe, the nature of causality, and the possibility of spontaneous generation. Islamic scholars, including physicians, astronomers, and natural philosophers, observed and studied the natural world, including plants, animals, and celestial phenomena. While their inquiries focused primarily on practical and empirical aspects of nature, they contributed to a broader understanding of the diversity and complexity of life.
5. **Indigenous Cultures:** Indigenous cultures around the world often developed rich and diverse cosmologies, creation myths, and oral traditions that reflected their understanding of the origins and development of life, and about the diversity of species. These stories usually include elements of change, adaptation, and transformation over time, and offer unique insights into humanity's relationship with the natural world. Many indigenous cultures viewed time as cyclical rather than linear, with recurring patterns of creation, destruction, and renewal. This cyclical perspective encompasses the idea of continual change and transformation in the natural world, including the evolution of species over time. Some indigenous cultures have interpreted fossils, geological formations, and natural phenomena in ways that reflect their cosmological beliefs and spiritual worldviews.



These interpretations differ from Western scientific explanations but provide cultural perspectives on the history and diversity of life on Earth.

While these historical perspectives on evolution greatly differ from modern scientific understanding, they reflect humanity's curiosity and attempts to make sense of the natural world and its processes of change. The development of modern evolutionary theory represents a culmination of centuries of scientific inquiry, observation, and experimentation, building upon and refining earlier ideas and insights.

In the centuries preceding Charles Darwin's formulation of the theory of evolution by natural selection, several thinkers proposed ideas and concepts that contributed to the development of evolutionary thought. Some of the main thinkers of evolution in pre-Darwinian times include:

3. **Lucretius (c. 99 – c. 55 BCE)**: A Roman poet and philosopher, Lucretius wrote “*De Rerum Natura*” (On the Nature of Things), in which he espoused a form of atomism and proposed ideas about the origins and development of life through natural processes.
4. **Georges-Louis Leclerc, Comte de Buffon (1707 – 1788)**: Buffon, a French naturalist, proposed theories of transmutation and transformation of species in his work “*Histoire Naturelle*” (Natural History). He suggested that environmental influences could lead to changes in organisms over time.
5. **Jean-Baptiste Lamarck (1744 – 1829)**: Lamarck, a French naturalist, proposed a theory of evolution based on the inheritance of acquired characteristics. He suggested that organisms could change over time in response to environmental pressures, and these acquired traits could be passed on to offspring.
6. **Erasmus Darwin (1731 – 1802)**: Erasmus Darwin, an English physician, naturalist, and grandfather of Charles Darwin, proposed evolutionary ideas in his work “*Zoonomia*” and other writings. He suggested that life evolved from simpler to more complex forms through a process of gradual transformation.

These thinkers and others contributed to the development of evolutionary thought in pre-Darwinian times, laying the groundwork for Charles Darwin's theory of evolution by natural selection in the 19th century. While their ideas differed from modern evolutionary theory, they reflected early attempts to understand the origins and development of life on Earth.

In the centuries preceding the formulation of Charles Darwin's theory of evolution by natural selection, various ideas and concepts about the origins and development of life were proposed by philosophers, theologians, and naturalists. These pre-Darwinian ideas laid the groundwork for later evolutionary theories. Some of the main ideas about evolution in pre-Darwinian times include:

1. **Great Chain of Being:** The concept of the Great Chain of Being, prevalent in ancient Greek, Roman, and medieval Christian thought, posited a hierarchical order of existence, with God at the pinnacle and all living beings arranged in a graded scale from simple to complex. While not a theory of biological evolution, it implied a continuum of life forms and the potential for change over time within a fixed, predetermined framework.
2. **Transformational Theories:** Some ancient philosophers, such as Empedocles and Anaximander, proposed ideas of transformation and change in the natural world, suggesting that living organisms arose from combinations of fundamental elements or evolved from simpler forms over time.
3. **Vitalism:** Vitalism, a prominent idea in the medieval and early modern periods, proposed that living organisms possessed a vital force or essence that distinguished them from inanimate matter. While not explicitly evolutionary, vitalistic concepts contributed to debates about the nature of life and its origins.
4. **Spontaneous Generation:** Spontaneous generation, the belief that living organisms could arise from non-living matter under certain conditions, was a widespread idea in antiquity and the Middle Ages. This notion suggested a form of continuous generation and transformation of life forms but did not imply a process of biological evolution as understood today.
5. **Transmutation of Species:** Some naturalists in the 17th and 18th centuries, such as Jean-Baptiste Lamarck, proposed theories of transmutation or transformation of species. Lamarck's theory, for example, suggested that organisms could change over time in response to environmental pressures and that acquired traits could be passed on to offspring.

Overall, these pre-Darwinian ideas about evolution reflected early attempts to understand the diversity and complexity of life on Earth. While they did not constitute a comprehensive theory of biological evolution, they contributed to the intellectual foundations upon which Darwin later built his groundbreaking theory of natural selection.

## 1.2 The Role of Biology (The role of natural evolution as a framework)

The introduction of Biology has these forms, el conjunto de las cuales muestra una línea creciente de aportación a la profundidad del análisis económico y al papel más ligero o pesado en el que interviene en la resolución de problemas complejos:

- **Biology as a theoretical framework,** sienta las bases conceptuales y relacionales sobre las que iniciar un análisis complejo en ciencias sociales y en economía. Se trata de un marco teórico que sirve de inspiración para afrontar una primera explicación o

una ampliación de la explicación de un problema social complejo sin tener que recurrir a un largo proceso de construcción teórica. Esto no significa que la teoría biológica sea siempre asimilada por la económica, sino que esta última sirve como espejo sobre la que construir un andamiaje teórico de forma más robusta y rápida.

- **Biology as a metaphor**, esto nos permite mejorar la explicación de los fenómenos económicos y reforzar nuestros argumentos al utilizar cadenas causales que ya están investigadas y demostradas en biología
- **Biology as a paradigm**, nos permite enfrentar el análisis económico teniendo delante un marco causal ya demostrado que podamos usar como referencia, tanto en el uso de los conceptos como en los flujos de interacción entre ellos. Digamos que el análisis económico no parte de cero ni necesita inventar un andamiaje metodológico y conceptual cada vez, sino que podemos recurrir a la biología para que nos aporte un marco de reflexión y pensamiento (que podemos ir adaptando a las estructuras y comportamientos que vamos descubriendo en economía) y que nos ahorra mucho tiempo y esfuerzo.
- **Biology as a canvas** to draw computational methods directamente aplicables a los procesos de resolución de problemas, i.e. captura de datos, modelos lógicos, procesamiento y funcionamiento de la información e interpretación de los resultados. Esto facilita y amplía nuestras capacidades a la hora de recurrir a herramientas que ya están diseñadas y han sido probadas en la resolución de problemas complejos y que podemos manipular y hacer crecer en un entorno computacional.

### 1.3 The Need for a Meta-Framework in the Social Sciences

*Successfully building well-being in students is not simply a matter of delivering a one-off positive education intervention. Rather, an embedded approach across interconnected systems throughout a whole school is needed (Waters 2011; White and Murray 2015). A meta-framework can give researchers and practitioners a purposeful direction within which to design, apply and evaluate interventions. Such a framework must have broad and generalizable parameters that reflect a comprehensive model of student well-being, while still offering the flexibility needed to choose and/or design interventions that are best suited for different contexts. @waters2019search (...) In addition to its higher-order comprehensive nature, if a meta-framework is going to be useful in advancing positive education it must be evidence-based and actionable. Thankfully, the field has amassed a decent preliminary evidence base on effectiveness to draw upon (see Waters 2017, for a recent review of the field) Waters and Loton (2019) (...) Resultantly, a meta-framework must be useful in supporting the decision making of educators and practitioners applying positive education knowledge and interventions in concrete ways with students. Consistent with leading thinkers in the field who assert that wellbeing is a multidimensional construct, and that students need to have the opportunity to develop a diverse range of skills to build wellbeing (Diener et al. 1999; Forgeard et al. 2011; Keyes and Annas 2009), a meta-framework must be multidimensional. @waters2019search (...) Currently, the majority of frameworks in positive*

education are not multidimensional but, rather, focus on only one or two aspects of wellbeing. For example, (...) Waters and Loton (2019)

## 1.4 Research question

One of the key questions that an evolutionary analyst can try to answer is what are the **mechanisms** that explain or direct the escalator of progress, whether this is the “struggle for existence” between individuals, nations, races, etc.

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.

*Research questions This review seeks to answer two questions: What research has been undertaken about the public’s views of walking and cycling as modes of transport? How do children’s, young people’s and parents’ views of the barriers to, and facilitators of, walking and cycling match interventions evaluated for their effects on walking and cycling?*

(From Methodology) *The review was conducted in three parts. First, we searched for and mapped the existing research literature on the general public’s views of walking and cycling. Second, we conducted an in-depth review of a subset of this literature, the scope of which was selected by our Advisory Group, focusing on the views of children, young people and parents. Third, we synthesised the findings relating to these ‘views studies’ together with the research on interventions carried out by Ogilvie et al. (2004). The overall conclusions of the review are thus based both on international evaluations of specific interventions, and from findings of recent ‘qualitative’ research conducted in the United Kingdom (UK) examining the views and experiences of children, young people and parents.*@brunton2006synthesis

*1 Scope The scope issues in this workshop are very important, but they relate, rather than just to the types of skills considered, to the clarification and positioning of precisely what the proposed ICT Skills Meta-Framework is (and what it is not)*European Committee for Standardization (2006)

*The design of frameworks arises first and foremost from the intended purpose, or application. This is fundamental, since – although frameworks designed for one purpose can be, and often are, used for purposes beyond those they were designed for, they may well not be particularly well-suited for the other applications, and so may not perform effectively in that context. In short, frameworks – once created - can “take on a life of their own”, and this can often produce unexpected, and sometimes undesirable, effects in other contexts.*@de2006european

*In short, the main priority of an ICT Practitioner Skills/Competence Framework (and any European Meta-Framework related to such frameworks) is to provide something largely specified by employers, and of real value to them as well as to those employed as - and those seeking work*

*as - ICT Practitioners, as well as stakeholders associated with both sides of the labour market. Its contribution as a platform via which the proposed EQF can be applied in relation to ICT Practitioner work remains secondary in the context of this Workshop European Committee for Standardization (2006)*

## 2 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.*

### 2.1 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 Hildén’s definition concerns the purpose of the information, what is termed hereon the ‘utilization’ function. Cornet and Gudmundsson (2015)*

### 2.2 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

### 3 Methodology

*framework analysis was developed for the explicit purpose of analyzing qualitative data in applied policy research. Framework analysis is an inherently comparative form of thematic analysis which employs an organized structure of inductively- and deductively-derived themes (i.e., a framework) to conduct cross-sectional analysis using a combination of data description and abstraction. @goldsmith2021using*

*The Framework Method was developed by researchers, Jane Ritchie and Liz Spencer, from the Qualitative Research Unit at the National Centre for Social Research in the United Kingdom in the late 1980s for use in large-scale policy research [1]. It is now used widely in other areas, including health research [3-12]. Its defining feature is the matrix output: rows (cases), columns (codes) and ‘cells’ of summarised data, providing a structure into which the researcher can systematically reduce the data, in order to analyse it by case and by code [1]. (...) Comparing and contrasting data is vital to qualitative analysis and the ability to compare with ease data across cases as well as within individual cases is built into the structure and process of the Framework Method. Gale et al. (2013). también Smith and Firth (2011)*

*The Framework Method provides clear steps to follow and produces highly structured outputs of summarised data. It is therefore useful where multiple researchers are working on a project, particularly in multi-disciplinary research teams where not all members have experience of qualitative data analysis, and for managing large data sets where obtaining a holistic, descriptive overview of the entire data set is desirable. (...) Importantly, the Framework Method cannot accommodate highly heterogeneous data, i.e. data must cover similar topics or key issues so that it is possible to categorize it Gale et al. (2013)*

*The Framework Method is most commonly used for the thematic analysis of semi-structured interview transcripts, which is what we focus on in this article, although it could, in principle, be adapted for other types of textual data [13], including documents, such as meeting minutes or diaries [12], or field notes from observations [10]. (...) Moreover, reflexivity, rigour and quality are issues that are requisite in the Framework Method just as they are in other qualitative methods Gale et al. (2013)*

*The Framework Method for the management and analysis of qualitative data has been used since the 1980s [1]. The method originated in large-scale social policy research but is becoming an increasingly popular approach in medical and health research; however, there is some confusion about its potential application and limitations. @gale2013using*



*The overall objective of framework analysis is to identify, describe, and interpret key patterns within and across cases of and themes within the phenomenon of interest. This flexible and powerful method of analysis has been applied to a variety of data types and used in a range of ways in applied research. Framework analysis consists of two major components: creating an analytic framework and applying this analytic framework. This paper details the five steps in framework analysis (data familiarization, framework identification, indexing, charting, and mapping and interpretation) through conducting secondary analysis on this special issue's common dataset. Goldsmith (2021)*

*Framework analysis—also known as “the framework approach,” “the framework technique” and “the framework method”—is an inherently comparative form of thematic analysis which employs an organized structure of inductively- and deductively- derived themes (i.e., a framework) to conduct cross-sectional analysis using a combination of data description and abstraction (Ritchie & Spencer, 1994; Spencer, Ritchie, Ormston, et al., 2014). The overall objective of framework analysis is to identify, describe, and interpret key patterns within and across cases of and themes within the phenomenon of interest through being both grounded in and interpreting from the data (Gale et al., 2013; King & Brooks, 2018; Ritchie & Spencer, 1994; Spencer, Ritchie, Ormston, et al., 2014).@goldsmith2021using*

*Policy-makers and practitioners are increasingly aware of the limitations of regarding randomised controlled trials as the sole source of ‘evidence’. This has resulted in growing calls for more inclusive forms of review, so that better use may be made of primary data. Some questions can only be appropriately answered by examining a range of data sources; maximum value can be gained from studies able to overcome problems with access to sensitive or hard-to-reach settings; contradictions in the evidence-base can be identified and examined; and theory development or specification of operational models can be optimised.@dixon2005synthesising*

*Noblit and Hare introduce a useful distinction between integrative and interpretive reviews. Instead, (Dixon et al., 2005) we suggest that integrative syntheses are those where the focus is on summarising data, and where the concepts (or variables) under which data are to be summarised are assumed to be largely secure and well specified (...) the primary focus of an integrative synthesis is not on the development of concepts or their specification. Dixon-Woods et al. (2005)*

*we suggest that the defining characteristic of an interpretive synthesis is its concern with the development of concepts, and with the development and specification of theories that integrate those concepts (...) An interpretive synthesis will therefore avoid specifying concepts in advance of the synthesis. In contrast with an integrative synthesis, it will not be concerned to fix the meaning of those concepts at an early stage. Dixon-Woods et al. (2005)*

*The interpretive analysis that yields the synthesis is conceptual in process and output, and the main product is not aggregations of data, but theory. Again it is important not to caricature an interpretive (...) Again it is important not to caricature an interpretive synthesis as therefore floating free of any empirical anchor: an interpretive synthesis of primary studies must be grounded in the data reported in those studies (...) might be concerned with the generation of*

*middle-range theories – explanations which apply in a specified domain, such as seeking to explain why people defer help-seeking for some types of symptoms. We argue that interpretive syntheses can be carried out on all types of evidence, both qualitative and quantitative. Dixon-Woods et al. (2005)*

*There is considerable overlap. Whilst most forms of synthesis can be characterised as being either primarily interpretive or primarily integrative in form and process, every integrative synthesis will include elements of interpretation, and every interpretive synthesis will include elements of aggregation of data. The choice of the form of synthesis is likely to be crucially related to the form and nature of the research question being asked Dixon-Woods et al. (2005)*

*Thematic analysis Thematic analysis, clearly sharing some overlaps with narrative summary and content analysis, involves the identification of prominent or recurrent themes in the literature, and summarising the findings of different studies under thematic headings. Summary tables, providing descriptions of the key points, can then be produced. @dixon2005synthesising*

*Thematic analysis allows clear identification of prominent themes, and organised and structured ways of dealing with the literature under these themes. It is flexible, allowing considerable latitude to reviewers and a means of integrating qualitative and quantitative evidence. However, it suffers from several important problems. Thematic analysis can be either data driven – driven by the themes identified in the literature itself – or theory driven – oriented to evaluation of particular themes through interrogation of the literature. The failure of much writing on thematic analysis to distinguish adequately between these two approaches has resulted in a lack of transparency. Dixon-Woods et al. (2005)*

*It is unclear whether the structure of the analysis should reflect the frequency with which particular themes are reported, or whether the analysis should be weighted towards themes that appear to have a high level of explanatory value. If thematic analysis is limited to summarising themes reported in primary studies, it offers little by way of theoretical structure within which to develop higher order thematic categories beyond those identified from the literature Dixon-Woods et al. (2005)*

*Framework analysis was originally developed as a method for analysing primary data in applied social research. We describe here how the same principles were employed in a systematic review to label the data of research reports in meaningful and manageable sections for subsequent retrieval and exploration. The result is both a general method for systematically reviewing diverse literature, and a framework for analysing public involvement in research in particular. Oliver et al. (2008)*

*The conceptual framework described in this paper built on our own experiences of public involvement, and on a detailed and sensitive search strategy to identify, then appraise and analyse relevant literature. Oliver et al. (2008)*

*Meta-framework analysis is a qualitative research method used to analyze and synthesize findings from multiple qualitative studies, particularly when those studies employ different theoretical frameworks or methodologies. This approach goes beyond traditional qualitative*

synthesis methods by aiming to integrate diverse perspectives and theories into a cohesive framework that captures the complexity of the research topic. Framework synthesis offers a highly structured approach to organizing and analyzing a sheer amount of data that presents the challenge for rigorous analysis (Barnett-Page and Thomas (2009)).

*Ritchie et al.(2003) in their advocacy of framework analysis. In framework analysis, before applying codes to the text, the researcher is encouraged to build up a list of key thematic ideas. These can be taken from the literature and previous research but are also generated by reading through at least some of the transcripts and other documents such as field notes, focus groups and printed documents. A similar view is taken by King (1998), who recommends the construction of a template, using similar sources of inspiration, which is a hierarchical arrangement of potential codes. In both King's template analysis and framework analysis, coding consists of the identification of chunks of text that exemplify the codes in this initial list. However, all these authors recognize that the researcher will need to amend the list of codes during analysis as new ideas and new ways of categorizing are detected in the text. Gibbs (2007)*

*They employed an iterative process involving familiarization with the literature, gradually developing a conceptual framework based on concepts derived from the review question and the theoretical and empirical literature, applying the framework systematically to evidence from the studies included in the review, and constructing a chart for each key dimension with distilled summaries from all relevant documents Dixon-Woods (2011).*

*Framework synthesis is distinct from the other methods outlined here in that it utilises an a priori „framework – informed by background material and team discussions – to extract and synthesize findings. As such, it is largely a deductive approach although, in addition to topics identified by the framework, new topics may be developed and incorporated as they emerge from the data. (...) One of the novel features of their approach is their use of a conceptual model that was used as an initial starting point for coding the evidence from 20 studies. This conceptual model was chosen because of its broad applicability to the area under review, and the authors did not engage in the more lengthy process of model specification that is often more characteristic of framework synthesis. They augmented analysis using this prespecified model with analysis that was more inductive, and ended up generating a revised conceptual model that provided a 'best fit' to the evidence reported in the studies they reviewed. The revised model included some factors that were absent from the original model, as well as adjustments to factors that had been reported in that model.(Barnett-Page and Thomas (2009))*

*The synthetic product can be expressed in the form of a chart for each key dimension identified, which may be used to map the nature and range of the concept under study and find associations between themes and exceptions to these (Brunton et al 2006). (Barnett-Page and Thomas (2009)).*

*Brunton et al applied the approach to a review of children s, young people s and parents views of walking and cycling; Oliver et al to analyse public involvement in health services research. Framework synthesis is distinct from the other methods outlined here in that it utilises an a*

*priori „framework – informed by background material and team discussions – to extract and synthesise findings. As such, it is largely a deductive approach although, in addition to topics identified by the framework, new topics may be developed and incorporated as they emerge from the data. The synthetic product can be expressed in the form of a chart for each key dimension identified, which may be used to map the nature and range of the concept under study and find associations between themes and exceptions to these (Brunton et al 2006).*

*framework synthesis builds on framework analysis,*

*This type of synthesis is based on framework analysis [3] and “offers a highly structured approach to organising and analysing data (e.g. indexing using numerical codes, rearranging data into charts etc.)” [2]. It involves the preliminary identification of apriori themes against which to map data from included studies. In contrast to such methods as meta-ethnography [4], framework synthesis is primarily a deductive approach. (...) a framework may not simply be an instrument for analysis but may also represent a scaffold against which findings from the different components of an assessment may be brought together and organised Carroll, Booth, and Cooper (2011)*

### **3.1 What is a Framework?**

*the role of frameworks as integral but often vague scientific tools, highlighting benefits and critiques. While frameworks can be useful for synthesizing and communicating core concepts in a field, they often lack transparency in how they were developed and how they can be applied (...) This article provides a meta-framework for visualizing and engaging the four mediating processes for framework development and application: (1) empirical generalization, (2) theoretical fitting, (3) application, and (4) hypothesizing Partelow (2023)*

### **3.2 Reasons to Choose Framework Analysis**

*We independently chose the framework approach to underpin data analysis for a range of reasons. First, the framework approach is particularly suited to the analysis of cross-sectional descriptive data enabling different aspects of the phenomena under investigation to be captured (Ritchie and Lewis 2003). Second, one of the advantages of the framework approach is that researchers’ interpretations of participants’ experiences are transparent (Ritchie and Lewis 2003). Third, for novice researchers moving from data management to developing the analysis sufficiently to answer the research questions posed can be a daunting and bewildering task. The interconnected stages within the framework approach explicitly describe the processes that guide the systematic analysis of data from the development of descriptive to explanatory accounts. Smith and Firth (2011)*

*The authors chose the framework synthesis approach because a published model was identified from the literature that conceptualised attitudes of adult women to the taking of vitamins and minerals [16]. The approach therefore was augmentative and deductive (building on this existing model or framework), rather than grounded or inductive (starting with a completely blank sheet). (...) The model identified did not entirely match the topic under study, but it was a “best-fit” and provided a relevant pre-existing framework and themes against which to map and code the data from the studies identified for this review. A list of themes was derived from this model (see Figure 1) and provided the a priori framework of themes against which to code the data extracted from the included studies. Carroll, Booth, and Cooper (2011)*

### 3.3 Characteristics

In **epistemological terms**, if we consider at two ends of the spectrum, one a highly constructivist vision of knowledge, and at the other, an unproblematic vision of knowledge as an “objective window open to the world,” the framework synthesis, although still implies a certain interpretation of the data, shares the attributes of critical realism where knowledge of reality is mediated by our perceptions and beliefs. Furthermore, its synthesis results are reproducible and correspond to a shareable objective reality.

Regarding the extent of iteration during the review process, framework analysis involves an iterative process of searching the literature.

Assessing quality is a key component in the review process of framework analysis. Typically, when performing a framework analysis, quality criteria are set for the selection of literature. Those studies that do not meet a certain number of the criteria are excluded.

Framework analysis focuses on describing and summarising their primary data (often in a highly structured and detailed way) and translating the studies into one another. However, it also seeks to push beyond the original data to a fresh interpretation of the phenomena under review.

With regards of the synthetic product, namely, what is the synthesis for? It is clear that framework analysis views itself as producing an output that is directly applicable to policy makers and designers of interventions. There are a few framework synthesis which involved policy makers and practitioners in directing the focus of the synthesis and used the themes derived from the synthesis to infer what kind of interventions might be most effective in encouraging walking and cycling. Likewise, the products of the thematic synthesis took the form of practical recommendations for interventions (e.g. „do not promote fruit and vegetables in the same way in the same intervention ).

*There are a number of approaches to qualitative data analysis, including those that pay close attention to language and how it is being used in social interaction such as discourse analysis [15] and ethnomethodology [16]; those that are concerned with experience, meaning and language such as phenomenology [17,18] and narrative methods [19]; and those that seek to develop theory*

derived from data through a set of procedures and interconnected stages such as Grounded Theory [20,21]. Many of these approaches are associated with specific disciplines and are underpinned by philosophical ideas which shape the process of analysis [22]. The Framework Method, however, is not aligned with a particular epistemological, philosophical, or theoretical approach. Rather it is a flexible tool that can be adapted for use with many qualitative approaches that aim to generate themes. gale2013using

Framework analysis operates from a pragmatic epistemology and can be applied to a variety of types of data and be employed for a variety of reasons (King & Brooks, 2018; Spencer, Ritchie, Ormston, et al., 2014). Data types used in framework analysis have included in-depth individual interviews, focus groups, observational data, policy documents, online discussion board posts, photographs, and case studies (Johnston et al., 2014; Mason et al., 2018; Ritchie & Spencer, 1994; Roberts, 2000; Robertshaw & Cross, 2019; Struik & Baskerville, 2014; Tallentire et al., 2015; Tishelman et al., 2016). Approaches to framework analysis in applied research have varied from highly deductive analysis of fairly structured data (Pope et al., 2000) to inductively-oriented theory-building work for knowledge users, such as policy makers and health care providers (e.g., Goldsmith et al., 2017; Swallow et al., 2011).@goldsmith2021using

Glossary of key terms used in the Framework Method Gale et al. (2013) Analytical framework: A set of codes organised into categories that have been jointly developed by researchers involved in analysis that can be used to manage and organise the data. The framework creates a new structure for the data (rather than the full original accounts given by participants) that is helpful to summarize/reduce the data in a way that can support answering the research questions

### 3.4 Key steps of meta-framework

it is worth taking a step back to consider briefly what needs to happen before analysis begins. The selection of analysis method should have been considered at the proposal stage of the research and should fit with the research questions and overall aims of the study (...) At this early stage it is also useful to consider whether the team will use Computer Assisted Qualitative Data Analysis Software (CAQDAS), which can assist with data management and analysis. Gale et al. (2013)

As any form of qualitative or quantitative analysis is not a purely technical process, but influenced by the characteristics of the researchers and their disciplinary paradigms, critical reflection throughout the research process is paramount, including in the design of the study, the construction or collection of data, and the analysis. All Gale et al. (2013)

It is important to remember when using the Framework Method that, unlike quantitative research where data collection and data analysis are strictly sequential and mutually exclusive stages of the research process, in qualitative analysis there is, to a greater or lesser extent depending on the project, ongoing interplay between data collection, analysis, and theory development. For example, new ideas or insights from participants may suggest potentially fruitful lines

*of enquiry, or close analysis might reveal subtle inconsistencies in an account which require further exploration.*@gale2013using

Here are the key steps involved in conducting a meta-framework analysis:

1. **Identify relevant studies:** Conduct a systematic search to identify qualitative studies related to the research topic. These studies may employ different theoretical frameworks, methodologies, or perspectives.
2. **Extract data:** Extract relevant data from each included study, including key concepts, themes, theoretical frameworks, and methodologies used.
3. **Code and categorize:** Analyze the extracted data by coding and categorizing the concepts, themes, and frameworks identified in the included studies. This process involves identifying similarities and differences across the studies.
4. **Develop a meta-framework:** Based on the coded data, develop a meta-framework that integrates the key concepts, themes, and theoretical frameworks identified in the included studies. The meta-framework should capture the overarching structure or framework that emerges from the synthesis of the individual studies.
5. **Refine the meta-framework:** Iteratively refine the meta-framework by revisiting the coded data and ensuring that it accurately represents the diversity of perspectives and theories present in the included studies.
6. **Analyze relationships:** Analyze the relationships between different elements of the meta-framework, such as how concepts and themes from different theoretical frameworks relate to each other or intersect.
7. **Interpret findings:** Interpret the findings of the meta-framework analysis in relation to the research question or objective. Discuss the implications of the synthesized framework for theory, practice, and future research.
8. **Report results:** Write up the results of the meta-framework analysis, describing the methodology used, presenting the synthesized framework, and providing supporting evidence from the included studies.

Meta-framework analysis offers a systematic approach to synthesizing qualitative research findings from diverse theoretical perspectives and methodologies. By integrating these perspectives into a cohesive framework, researchers can gain a more comprehensive understanding of the research topic and contribute to the advancement of knowledge in the field.

*Framework analysis consists of two major components: creating an analytic framework and applying this analytic framework. These two major components occur through five steps: (1) data familiarization; (2) identifying a thematic framework; (3) indexing all study data against the framework; (4) charting to summarize the indexed data; and (5) mapping and interpretation of patterns found within the charts (Ritchie & Spencer, 1994). The hallmarks of framework analysis are found in the last three steps, namely the emphasis on systematic and comprehensive*

*indexing across all the data (in step 3), the intentional organizing of the indexed data into a matrix format (in step 4), and comparative analysis within this matrix format to identify key patterns and abstractions (in step 5). Goldsmith (2021)*

*The framework approach has five stages (which share features of both the comparative and translational approaches to interpretive synthesis described above): 1 familiarisation with the data and/or studies (i.e. reading and re-reading) 2 identification of a thematic framework, typically derived from the research questions 3 indexing or coding of the data/ and/or studies 4 charting (i.e. transfer of summaries to matrix displays) 5 mapping and interpretation Mays, Popay, and Pope (2007)*

*Step 1: Data Familiarization As the first step in the analysis, data familiarization provides the researcher with an initial, purposeful understanding of the data. Through immersion in the data and making notes about key ideas, the researcher begins to understand major themes in the data. Items that could be major themes include topics or issues that relate to the research question(s) and recur across the data. The data familiarization step continues until the researcher feels they have arrived at a reasonable initial understanding of the data, including the breadth of variation within the data (Spencer, Ritchie, O'Connor, et al., 2014) (...) the dataset volume or study timelines require purposeful sampling from the study dataset for the data familiarization step (...) Coding can be a part of the data familiarization process, but it is not required. Some researchers like to immediately start working with preliminary codes linked to data at this early stage, even if they are later deleted or heavily reworked. Other researchers prefer to take notes about their thoughts about and understanding of the data without explicitly linking these thoughts to portions of the data. Understanding major themes in the data—the desired outcome of the data familiarization stage—is not dependent on coding at this stage. Goldsmith (2021)*

*Step 2: Framework Identification This second step moves the analysis from concrete descriptions of themes in the data to the identification of more abstract concepts, with the objective of providing a framework, or a structure for the analysis and the resulting interpretation. This framework or analytic structure is usually built from a combination of a priori and emergent concepts and themes (Ritchie & Spencer, 1994). These themes and concepts are then grouped, ranked, or otherwise ordered in a way that helps the researcher address the focus of the study. Typically, frameworks are composed of major themes and concepts (hereafter called components), which are supported by other themes and concepts elaborating on or sub-dividing the major themes and concepts (hereafter called sub-components). Like many other forms of qualitative analysis, the typical framework structure can be thought of as a tree with many branches.(...) the identifying the framework step is an iterative process. An initial framework is tested against a manageable portion of the data and refined as necessary to move from simple description to conceptual abstractions (Ritchie & Spencer, 1994). Refinements can include re-naming components, identifying new components, deleting components, collapsing components, and reordering components. Similar refinements can also occur at the sub-component level. Goldsmith (2021)*



*The development of themes is a common feature of qualitative data analysis, involving the systematic search for patterns to generate full descriptions capable of shedding light on the phenomenon under investigation. In particular, many qualitative approaches use the ‘constant comparative method’, developed as part of Grounded Theory, which involves making systematic comparisons across cases to refine each theme [21,23]. Unlike Grounded Theory, the Framework Method is not necessarily concerned with generating social theory, but can greatly facilitate constant comparative techniques through the review of data across the matrix.*@gale2013using

*I then worked through the three focus group transcripts, attaching text in the transcripts to the draft framework using a computer-assisted qualitative data analysis software (CAQDAS) program. I created new framework components when I encountered text that did not fit the draft framework yet would be helpful for understanding the two provider types and the birth process. I also created sub-components where I felt it would be helpful to develop a more nuanced understanding of the data for this step. This approach resulted in the addition of sub-components throughout the framework plus two additional framework components (right column of Table 2). I considered whether I should reorder the components from the initial framework but did not see an obvious new order. I also knew that I could revisit the consideration of reordering through the next step.*@goldsmith2021using

*Coding is a common part of the framework identification stage, although it is possible to arrive at a well-functioning framework without having engaged in explicit coding work. The emphasis at this stage is on completing the framework—the identification of the important themes and concepts and the conceptual relationship they have to each other—rather than an emphasis on how the important themes and concepts play out in the data. For identifying the framework in the TBA dataset, I chose to engage in explicit coding as I wanted a stronger handle on the data and the patterns within. I also chose to initiate this coding with a CAQDAS program rather than via pen and paper as I expected I would want the flexibility to quickly reorder, collapse, and split codes as my understanding of the data deepened. Had I been involved in the study design and data collection phases of the TBA study, I might have started the framework identification step with a strong grasp of the data and opted to complete the entirety of this step using pen and paper and without much explicit coding work.*@goldsmith2021using

*Step 3: Indexing* Once a reasonable framework has been identified, the next step in framework analysis is to systematically apply the framework to all of the study data (Ritchie & Spencer, 1994). This process is called indexing as it resembles the process used to create the index of a book (Spencer, Ritchie, O’Connor, et al., 2014). The linking of study data and framework components can be accomplished using any approach with which the researcher is comfortable for coding data (e.g., pen and paper, using the comment function in a word processing program, or a CAQDAS program). Many researchers with access to a CAQDAS program will opt to use it at this stage to facilitate the data manipulation required in framework analysis’ subsequent steps (...) Before indexing can begin, the researcher must determine the appropriate way to link framework components with applicable study data. There is no standard linking structure to rely on like the page numbers in a book index. Rather, the study data are linked to framework components via the appropriate units of analysis—namely, the entities or items which are the

focus of the study framework. For some frameworks, the data collection sampling units can also be used as the units of analysis. Other frameworks operate at a different altitude with respect to the study topic than was the case during the study's initial design or data collection phases, necessitating using units of analysis which differ from the data collection sampling units. (See Goldsmith et al., 2017 for an example of framework analysis using units of analysis which differ from the data collection sampling units Goldsmith (2021))

The indexing step also provides an important opportunity for framework revision as applying the framework to all study data simultaneously necessitates assessing how well the framework works with and for the study data. Framework testing and revision tasks in the indexing step consist of affirming and amending the definitions and boundaries of each framework component and sub-component and adding to framework sub-components to accommodate new variation. The researcher may even encounter data in the indexing step for which the framework does not work, requiring revisiting the overall structure and contents of the framework. Regardless of what revisions are made, framework indexing and revision must continue in an iterative process until all data are indexed on the final framework.(...) By this point in time, I knew that the framework worked for all the data and I made no revisions to the framework. This is an unusual situation and readers should more often expect that indexing will be accomplished as a distinct step after framework identification and the framework is likely to be refined during the indexing step. Goldsmith (2021)

*Step 4: Charting* The next step in framework analysis is a process of ordering and abstracting the now-indexed study data such that the data can be examined systematically and in totality. This is accomplished through creating one or more charts summarizing the study data. The chart(s) are organized in a matrix form, using ordered rows and columns populated by the units of analysis and the framework components. Although charting is primarily focused on summarizing the study data, charting is also dependent on the work done in the earlier steps of framework analysis. The act of charting is an opportunity to revisit and enhance earlier decisions around the appropriate units of analysis, the order of units of analysis and framework components, the appropriate level of data abstraction, and the adequacy of the framework for the data at hand (...) With respect to revisiting and enhancing decisions around the appropriate units of analysis, charting the indexed study data may make it obvious that it is not possible to carry forward one or more of the units of analysis from the indexing step. For Goldsmith (2021)

With respect to revisiting and enhancing the order of units of analysis and framework components, charting demands an explicit order to the layout of rows and columns. The researcher may not have needed to be concerned about imposing order on the units of analysis before now—data may have been indexed in the order that individuals were interviewed, for instance. And while framework components are more likely to already have order suggested by the earlier framework identification and indexing steps, the act of charting can still push the researcher to enhance the order of framework components. Regardless of the state of order of units of analysis and framework components prior to this step, the researcher uses the research questions and the developing analysis to ensure there is explicit and sufficient order to the units of

analysis and framework components on the chart(s). Imposing order can be simple, such as grouping units of analysis by key characteristics. Goldsmith (2021)

Once the charting structure of the rows and columns is established, the researcher can move onto populating the interior cells of the chart(s). This requires reviewing the data in its indexed form (Spencer, Ritchie, O'Connor, et al., 2014) and determining or revisiting the appropriate level of abstraction for the data. @goldsmith2021using

Researchers use a variety of approaches to create the chart or charts for their framework analyses. Some use pen and paper while others create charts using tables in word processing computer programs or spreadsheet computer programs (e.g., Swallow et al., 2003). Others use CAQDAS programs alone or in combination with aforementioned approaches to arrive at a completed chart (see Goldsmith et al., 2017 for an example of the latter). To the best of my knowledge, NVivo (version 9 and above) is the only CAQDAS program which facilitates the entirety of framework analysis, including charting, and allows for retaining live links between the cells in the chart and study data Goldsmith (2021)

To create the chart for the TBA dataset, I reviewed the study data by framework component and stakeholder group within the CAQDAS program and then manually entered my summary of the data in the relevant cell on a table I created in a word processing program (Table 3). The framework continued to work well for the TBA data, and no new framework components or sub-components were added to the chart Goldsmith (2021)

The charting step results in one or more charts, with the number of charts dependent on the data and the researcher's preferences. Where the data are not manageable in a single chart, for example, the researcher may subdivide the data by framework components or by units of analysis. For the TBA dataset, it was possible to use a single chart as the combination of each framework and charted data could be reasonably assessed as a single whole. Goldsmith (2021)

*Step 5: Mapping and Interpretation* The final step in framework analysis—mapping and interpretation—is where the researcher combines the key learnings from the earlier steps, including hunches about patterns to explore in the data, with comparisons across and within units of analysis and across and within framework components. Comparisons of potential interest at this step include examining variation across the entire dataset, examining variation within subgroups and subthemes, and looking for clusters of data. The charts and other data are reviewed, recombined, collapsed, or condensed as suggested by the study focus, data, and major patterns. The researcher is ultimately trying to tell a compelling story about how the data are structured and patterned Goldsmith (2021)

There is no single form of product from framework analysis. The results of mapping and interpretation can be shown in a variety of ways, including identifying and describing key concepts or the nature and range of particular phenomena; demonstrating associations across units of analysis for key concepts or particular phenomena; explaining attitudes, experiences and behaviors; and creating typologies (Ritchie & Spencer, 1994). This list should not be seen as a complete list; the researcher is encouraged to be creative and follow the analysis to where

*the researcher is led even if the approach is not listed above. (See Ritchie & Spencer, 1994, for multiple varied examples of mapping and interpretation products). Goldsmith (2021)*

EL marco de Gale et al. Gale et al. (2013) consiste en estas etapas: 1) Transcription, 2) Familiarisation with the interview, 3) Coding, 4) Developing a working analytical framework, 5) Applying the analytical framework, 6) Charting data into the framework matrix, 7) Interpreting the data

*Coding: In more inductive studies, at this stage ‘open coding’ takes place, i.e. coding anything that might be relevant from as many different perspectives as possible. Codes could refer to substantive things (e.g. particular behaviours, incidents or structures), values (e.g. those that inform or underpin certain statements, such as a belief in evidence-based medicine or in patient choice), emotions (e.g. sorrow, frustration, love) and more impressionistic/methodological elements (e.g. interviewee found something difficult to explain, interviewee became emotional, interviewer felt uncomfortable) [33]. In purely deductive studies, the codes may have been pre-defined (e.g. by an existing theory, or specific areas of interest to the project) so this stage may not be strictly necessary and you could just move straight onto indexing, although it is generally helpful even if you are taking a broadly deductive approach to do some open coding on at least a few of the transcripts to ensure important aspects of the data are not missed.@gale2013using*

*Coding aims to classify all of the data so that it can be compared systematically with other parts of the data set. (...) Coding can also be done digitally using CAQDAS, which is a useful way to keep track automatically of new codes. However, some researchers prefer to do the early stages of coding with a paper and pen, and only start to use CAQDAS once they reach Stage 5 (see below) Gale et al. (2013)*

*Stage 4: Developing a working analytical framework After coding the first few transcripts, all researchers involved should meet to compare the labels they have applied and agree on a set of codes to apply to all subsequent transcripts. Codes can be grouped together into categories (using a tree diagram if helpful), which are then clearly defined. This forms a working analytical framework. It is likely that several iterations of the analytical framework will be required before no additional codes emerge (...) the analytical framework is never ‘final’ until the last transcript has been coded. Gale et al. (2013)*

*Stage 5: Applying the analytical framework The working analytical framework is then applied by indexing subsequent transcripts using the existing categories and codes. Each code is usually assigned a number or abbreviation for easy identification (and so the full names of the codes do not have to be written out each time) and written directly onto the transcripts. Computer Assisted Qualitative Data Analysis Software (CAQDAS) is particularly useful at this stage because it can speed up the process and ensures that, at later stages, data is easily retrievable. It is worth noting that unlike software for statistical analyses, which actually carries out the calculations with the correct instruction, putting the data into a qualitative analysis software package does not analyse the data; it is simply an effective way of storing and organising the data so that they are accessible for the analysis process. Gale et al. (2013)*

*Stage 6: Charting data into the framework matrix* Qualitative data are voluminous (an hour of interview can generate 15–30 pages of text) and being able to manage and summarize (reduce) data is a vital aspect of the analysis process. A spreadsheet is used to generate a matrix and the data are ‘charted’ into the matrix. Charting involves summarizing the data by category from each transcript. Good charting requires an ability to strike a balance between reducing the data on the one hand and retaining the original meanings and ‘feel’ of the interviewees’ words on the other. The chart should include references to interesting or illustrative quotations. These can be tagged automatically if you are using CAQDAS to manage your data Gale et al. (2013)

*Stage 7: Interpreting the data* It is useful throughout the research to have a separate note book or computer file to note down impressions, ideas and early interpretations of the data. It may be worth breaking off at any stage to explore an interesting idea, concept or potential theme by writing an analytic memo [20,21] to then discuss with other members of the research team, including lay and clinical members (...) Gradually, characteristics of and differences between the data are identified, perhaps generating typologies, interrogating theoretical concepts (either prior concepts or ones emerging from the data) or mapping connections between categories to explore relationships and/or causality. If the data are rich enough, the findings generated through this process can go beyond description of particular cases to explanation of, for example, reasons for the emergence of a phenomena, predicting how an organisation or other social actor is likely to instigate or respond to a situation, or identifying areas that are not functioning well within an organisation or system. It is worth noting that this stage often takes longer than anticipated and that any project plan should ensure that sufficient time is allocated to meetings and individual researcher time to conduct interpretation and writing up of findings (see Additional file 1, Section 7). Gale et al. (2013)

the existing model acted as the basis for the synthesis and could be built-upon, expanded upon, reduced or added to by these new data. Each reviewer checked and examined critically the extraction and categorisation or coding of data performed by the other. The principal aim of this process was to examine the first reviewer’s categorisation of the data, i.e. either to verify the coding or to challenge it by offering an alternative.(...) A consensus was reached on which a priori themes were supported by the data, and whether new themes identified by the reviewers did actually map either to a pre-existing theme or to one another (c.p. reciprocal translation [2]). The result was a finalised list of themes. The primary reviewer (CC) then offered an interpretation of the relationships between the themes based in part on the relationships as they were represented in the original model (see Figure 1), and also based on the data itself, which suggested, for example, that “the media” inputted into the central procedural themes of both perceived need and decision- making. The new model was then critically considered by all reviewers. A revised conceptual model was therefore developed building on the earlier, identified model, to describe and explain people’s views around the taking of potential chemopreventive agents. Carroll, Booth, and Cooper (2011)

*Data synthesis and development of model* A combination of coding against pre-existing themes and the generation of and assignment of data to new, agreed themes, generated the model

presented in Figure 2. A full description of the evidence supporting this model is published elsewhere [8]. Carroll, Booth, and Cooper (2011) (ver el framework que presenta en el artículo)

(esta es la referencia a la figura del cuadro con el Framework) The model describes the processes involved in an individual's decision about whether or not to take possible chemopreventive agents. The process runs from the first stages of perceived need, on the left, through the decision-making process itself, to final non- use or use, and maintenance of use, on the right. @carroll2011worked

(y sigue la explicación comparando el Framework 1 obtenido de la literatura, con el Framework 2 que es al que llegan los autores) Since the source of the preliminary framework was a single published model, the manner in which new themes built-on, developed and altered this preliminary conceptual framework is quite transparent. In this review, this may be assessed in part by comparing Figure 1 with Figure 2. The principal procedural elements of the preliminary model also held true for this sample of studies and their population, i.e. the transition through the stages of perceived need, decision-making, risk versus benefit and use or non-use. These elements also reflect the three key stages of Contemplation,... Carroll, Booth, and Cooper (2011)

The a priori identification of these key constructs (en el Framework 1) therefore enabled therapid coding of studydatafromthisreviewagainst these tested and highly relevant components of health behaviour decision-making. The preliminary framework also provided “themes” that informed the “perceived need” and “decision-making” stages of the model (see numbers 1-9 in Figure 1). Once clear definitions had been applied to each of these themes, the study data were coded rapidly against them. Very little study data were coded against the themes of “Spending capacity” (or “Costs”)and “Access: obtaining the agent”,which may reflect differences in the cultural context of the preliminary conceptual model (a low-income country in South America) compared with the studies included in the review (principally UK, Europe and North America). However, relatively more substantial amounts of data were coded against the remaining themes. Carroll, Booth, and Cooper (2011)

Extension of the preliminary conceptual framework to generate the final model Despite these helpful overlaps, which permitted rapid and reliable coding of much data from the included studies, the preliminary model lacked sufficient depth or complexity to explain all the data in the included studies. (... lo que sigue es el ejemplo de explicación) All of these characteristics were found in the included studies to affect perceived need and decision- making. It was felt that the pre-existing theme of “personal factors” alone was insufficient to illustrate the complexity of factors at play. The role of age, gender and the physical properties of agents were new factors identified by the synthesis affecting the a priori theme of use, which were absent from the original conceptual model. Carroll, Booth, and Cooper (2011)

(y sigue con la comparativa entre frameworks) Relationships between the themes were not well-developed in the preliminary model. The synthesis found that not only did family, physicians and others affect decision making, but also that this relationship was moderated by the credibility of the source and the clarity of the infor- mation being given. (...) Indeed, unlike the existing

models, which appear to be exclusively linear, the model that resulted from this synthesis was potentially more recursive: the decision-making stage might still be revisited on the basis of side-effects (“risks”) experienced at the stage of use. This new model can therefore be seen not only to validate, but also to build upon, extend and contextualise existing, relevant published models. The a priori boxes of Contemplation, i.e. perceived need; Determination, i.e. decision-making; and Action, i.e. use and maintenance, have been opened to reveal the complexities of the factors therein, their relationships and moderators. Carroll, Booth, and Cooper (2011)

(Sobre las diferencias/desviaciones entre los enfoques habituales y el empleado por los autores) This approach differs from other published versions of framework synthesis in which the a priori framework was developed from a range of sources, including familiarisation with and consultation around the published background literature, both theoretical and empirical, and personal experiences [5,6]. The approach taken here is of potential value for systematic reviewers as it does not require such extensive literature review, consultations or topic expertise to develop an a priori framework before embarking on the review itself. This may be of particular value when undertaking a synthesis of qualitative evidence within the limited timeframes of a health technology Carroll, Booth, and Cooper (2011)

(y sigue con la justificación) However, if a framework of related, relevant concepts already exists, then the approach used here permits a far more rapid identification of the a priori framework; it also permits more rapid and structured coding and synthesis of data from the review’s included studies than grounded-theory techniques. In this way, where existing theories or models exist, they can be tested against the evidence for the review’s own particular criteria and evidence. This approach is therefore potentially more pragmatic than other forms of qualitative data synthesis (...) Furthermore it provided a mechanism for flagging up and explicitly communicating divergent findings or themes within the review team. The resultant synthetic product is expressed as an enhanced model recording each key dimension identified; the nature of the concepts under study; and associations between themes and tensions between them [6] Carroll, Booth, and Cooper (2011)

### 3.4.1 Literature selection

Criterios para elegir la literatura primaria y complementaria. Criterios de búsqueda en base de datos.

A systematic search to identify relevant studies was performed by an information specialist following piloting of appropriate search strategies. The search combined terms describing the agents of interest (NSAIDs, aspirin, vitamins, etc.) with a published, validated filter for identifying qualitative studies, together with the medical subject heading “qualitative research” [11]. The full search strategy is available in the Appendix (...) Study selection To be included in the review, a study had to focus on exploring the attitudes, perceptions and beliefs of adults (any country) surrounding the taking of the agents listed above, through qualitative data from interviews or focus groups, and cross-sectional data from satisfaction surveys, i.e. unstructured

and structured, but often textual data describing people's own, personal, subjective experiences, views or attitudes relating to the intervention of interest. Carroll, Booth, and Cooper (2011)

To uncover peer reviewed research on school-based positive education interventions, a systematic literature search was conducted using the four databases of: Scopus®, Google Scholar, PsycINFO®, and Web of Science®. Additionally, the reference lists of review articles that were identified through the above search were cross-checked using the ancestry method outlined in Lyubomirsky et al. (2005), in order to capture the broadest collection of relevant articles possible. To qualify for inclusion, studies had to meet eight key criteria. First, the study had to be peer-reviewed and published in an academic journal and, thus, have withstood the scrutiny of the peer review process. Second, the (...) Waters and Lotton (2019)

Seventy-five school-based positive education intervention studies were identified as meeting the criteria above and form the basis of this review. Table One provides definitions of the six SEARCH pathways and lists the sub-categories of interventions that were identified in each pathway for the current review. Waters and Lotton (2019)

For consistency across the presentation of the review findings, the same structure has been used when mapping each of the six pathways to the studies identified. First, the specific interventions that can be mapped to each pathway are identified. For example, under the pathway of attention and awareness, the specific interventions identified in the school-based interventions were mindfulness and meditation (...) Waters and Lotton (2019)

Finally, and most importantly, the evidence supporting each pathway is considered. This evaluation is structured around the three key research questions listed in the former section and considers how the evidence meets Seligman et al.'s (2009) broad aims of positive education: to improve both wellbeing and academic outcomes. @waters2019search 3.2 Pathway One: Strengths

*Literature searching and analysis* Our literature searches across medicine, nursing, social welfare and the social sciences covered reports published in academic journals and patient- and carer-group publications, and unpublished reports accessible through professional and patient or public networks. As we accumulated literature, we followed an iterative process similar to framework analysis as applied to primary research data (ver Ritchie). This involved familiarization with the literature; gradually developing a conceptual framework using concepts embedded in the review question, and in the theoretical and empirical literature; applying the framework systematically to the data; and subsequently rearranging the data within the framework in order to construct a chart for each key dimension with distilled summaries from all relevant documents identified. The charts were then used to map the range and nature of involvement and find associations between themes with a view to providing explanations for the findings. We describe below the key concepts used to build our framework, and how these were combined so as to enable us to analyse and draw conclusions from the literature. Oliver et al. (2008)

*Categorizing the literature* As well as reports of public involvement, we found discussion papers about differing priorities, conceptual frameworks, community equi- poise, power, democratic



practice and advocacy. These papers drew on a wide range of theories, and described episodes of involvement in many different research areas. (...) The health topics covered in the literature included different health conditions (asthma, breastfeeding (...)) The papers came from different disciplines (agriculture, genetics, environmental studies) and reported different research methodologies (systematic reviews, technology assessment, participatory research). Oliver et al. (2008)

Reports of public involvement were first characterized as ÔpurposefulÕ, ÔopportunisticÕ or ÔindirectÕ. (a continuación hay que explicar a qué se refiere cada) Oliver et al. (2008)

Framework analysis is designed so that it can be viewed and assessed by people other than the primary analyst. Consequently, framework analysis in a systematic review displays the data in such a way that readers can navigate the charts to find evidence relevant to their circumstances (in this case, for instance, international or national programmes or individual projects), or to the options available to them (e.g. patient organizations responding to consultations or only entering collaborative partnerships or taking the initiative). Applying the framework to these data reveals the theories that have been applied to work constructively with individuals,23,24 or within organizations (...) Thus, readers can draw out for themselves relevant implications for their policy and practice from what is known about public involvement in research agenda setting Oliver et al. (2008)

Published descriptions of framework synthesis typically exclude studies of lower quality. However this was not the approach used in this case, representing a further innovative deviation from the published method [2]. All studies that satisfied the relevance criteria were included because there is an increasingly strong case for not excluding qualitative data studies from evidence synthesis based on quality assessment [1,18,19]. (...) Studies were assessed using key quality criteria derived from relevant critical appraisal checklists for qualitative studies [20] and other systematic reviews of people's views [1,2]. These elements also appear in recent guidance from the Cochrane Qualitative Research Methods Group [21] Carroll, Booth, and Cooper (2011)

### 3.4.2 Method

Mecanismo utilizado para identificar "themes" relevantes. Tabla de "Themes" -> Resumen de la "rationale" + Fuentes donde aparecen en la literatura

The review was conducted in three parts. First, we searched for and mapped the existing research literature on the general public's views of walking and cycling. Second, we conducted an in-depth review of a subset of this literature, the scope of which was selected by our Advisory Group, focusing on the views of children, young people and parents. Third, we synthesised the findings relating to these 'views studies' together with the research on interventions carried out by Ogilvie et al. (2004). The overall conclusions of the review are thus based both on international evaluations of specific interventions, and from findings of recent 'qualitative' research conducted

*in the United Kingdom (UK) examining the views and experiences of children, young people and parents. Brunton et al. (2006)*

*Analysis of this research revealed four recurrent themes drawn from the views of children, young people and parents: a culture of car use; fear and dislike of local environments; children as responsible transport users; and parental responsibility and behaviour. @brunton2006synthesis*

### **3.4.3 Inductive vs Deductive Approach**

*However, the tool itself has no allegiance to either inductive or deductive thematic analysis; where the research sits along this inductive-deductive continuum depends on the research question. @gale2013using*

*The difference would become apparent in how themes are selected: in the deductive approach, themes and codes are pre-selected based on previous literature, previous theories or the specifics of the research question; whereas in the inductive approach, themes are generated from the data through open (unrestricted) coding, followed by refinement of themes. In many cases, a combined approach is appropriate when the project has some specific issues to explore, but also aims to leave space to discover other unexpected aspects of the participants' experience or the way they assign meaning to phenomena. In sum, the Framework Method can be adapted for use with deductive, inductive, or combined types of qualitative analysis. @gale2013using*

### **3.4.4 Flaws of Framework Method**

*The method is however dependent on the identification of an appropriate existing conceptual model. ( )... it required search strategies that aimed to maximise the likelihood of retrieving a model of pragmatic utility to the project; the aim was not the systematic identification of all such models. @carroll2011worked*

*Some issues were encountered when piloting this "best fit" framework synthesis method. When initially seeking to code the extracted data from the included studies using the themes derived from the relevant model, the two reviewers were not always coding the same data against the same themes. It therefore became apparent that each of the a priori themes had to be clearly defined in order to facilitate the coding process (...) The subsequent provision of clear consensual definitions not only enhanced the reliability of the coding, but also strengthened the rigour of the synthesis. Carroll, Booth, and Cooper (2011)*

*It further became apparent that additional analysis was needed to interpret and analyse data which could not be reliably assigned to any of the pre-existing, apriori themes, or, in the case of "personal factors", for which the pre-existing theme was inadequate. In this sense the usefulness of a particular framework is not only determined by "conceptual fit" but also by pragmatic concerns of what proportion of the study data can be accommodated within it. Further thematic*

analysis of data from the included studies was therefore required. Carroll, Booth, and Cooper (2011)

The resulting agreed new themes were then incorporated with the pre-existing themes into a new conceptual model that captured the data and reflected a possible network of relationships between those data-driven themes. The Carroll, Booth, and Cooper (2011)

Finally, this review did not exclude studies on the basis of quality, thereby deviating from one element of the published description of framework synthesis [2]. The internal validity of a review depends in part on the quality of included studies and the reliability of their findings. Currently there is much debate and little consensus around the feasibility and usefulness of quality assessments of qualitative studies in evidence synthesis [18].(...) Some techniques, such as meta-ethnography [4], and the previously published form of framework synthesis, actively exclude studies on the basis of the quality assessment.(...) All twenty included studies were assessed as being of similar, generally satisfactory “quality”, so, from this perspective, study quality did not provide a potential explanation for any differences in findings. The issue of the inclusion or exclusion of studies for this type of synthesis, based on their assessed quality, therefore remains unresolved based on this case study. Carroll, Booth, and Cooper (2011)

It is also the case that an apparently appropriate a priori model may be found only to accommodate a small proportion of the data from a review’s included studies. In such a case, secondary thematic analysis would form the principal approach to synthesis, thus reducing the major potential pragmatic benefits of the best-fit approach described in this paper. Reviewers must therefore exercise careful consideration of the potential external validity of existing models based on the behaviour and population of interest Carroll, Booth, and Cooper (2011)

### 3.5 Other Alternative Methods

#### *Meta-synthesis*

Thematic analysis (TA) is a technique for the analysis of qualitative data which allows you to identify or develop patterns of meaning and/or central ideas that unify them (referred to as themes) pertaining to a given set of data. You will then use these themes to organize, describe or interpret (perceptions of) reality (Boyatzis, 1998; Braun & Clarke, 2006, 2021). Once (relationships among) themes are identified, you need to interpret their relevance and implications for the research question you aim to answer. Verbal individual or group interviews (see King et al. 2018), focus group data (see Barbour, 2008) or textual data (written material) are usually at the core of thematic research. Nevertheless, video material and images might also be thematically analysed (Joffe, 2012).@stevens2022qualitative

### 3.5.1 Atlas.ti

**Process (according to Atlas.ti):** Thematic framework: Central to framework analysis is the development of a framework identifying key themes, concepts, and relationships in the data. The framework guides the subsequent stages of coding and charting.

**Flexibility:** While it provides a clear structure, framework analysis is also adaptable. Depending on the objectives of the study, researchers can modify the process to better suit their data and questions.

**Iterative process:** The process in framework analysis is not linear. As data is collected and data analysis progresses, researchers often revisit earlier stages, refining the framework or revising codes to better capture the nuances in the data.\*

**Benefits of framework analysis** Conducting framework analysis has several advantages:

**Rigorous data management:** The structured approach means data is managed and analyzed with a high level of rigor, minimizing the potential influence of preconceptions.

**Inclusivity:** Framework analysis accommodates both a priori issues, driven by the research questions, and emergent issues that arise from the data itself.

**Comparability:** Given its structured nature, framework analysis allows researchers to compare and contrast data, facilitating the identification of patterns and differences.

**Accessibility:** By presenting data in a summarized, charted form, findings from framework analysis become more accessible and comprehensible, aiding in reporting and disseminating results.

**Relevance for applied research:** Given its origins in policy research and its clear focus on addressing specific research questions, framework analysis is particularly relevant for studies aiming to inform policy or practice.

**Implementing** Familiarization with the data Before discussing a more detailed analysis, it's paramount to understand the breadth and depth of the data at hand.

**Reading and re-reading:** Begin by reading textual data such as transcripts, field notes, and other data sources multiple times. This immersion allows researchers to understand participants' perspectives and grasp the overall context.

**Noting preliminary ideas:** As researchers familiarize themselves with the data, preliminary themes or ideas may start to emerge. Jotting these down in memos helps in forming an initial understanding and can be instrumental in the subsequent phase of developing a set of themes.

**Developing a thematic framework** As is the case across nearly all types of qualitative methodology, central to framework analysis is the construction of a robust analytical framework. This structure aids in organizing and interpreting the data.

Identifying key themes: Based on the initial familiarization, it's important to identify themes that occur in the multimedia or textual data. These themes should be relevant to the research question. Researchers can begin assigning codes to specific chunks of data to capture emerging themes.

Categorizing and coding: Each identified theme can further be broken down into sub-themes or brought together under categories. At this stage, researchers can continue coding (or recoding) their data according to these themes or categories.

Refining the framework: As the analysis progresses, the initial themes represented by your coding framework may need adjustments. It's an iterative process, where the framework can be continually refined to better fit the data.

Indexing and charting the data Once the framework is established, the next phase involves systematically applying it to the data.

Indexing: Using the resulting coding framework, you can verify that codes have been systematically assigned to relevant portions of the data. This ensures every relevant piece of data is categorized under the appropriate theme or sub-theme.

Charting: This step involves creating charts or matrices for each theme. Data from different sources (like interviews or focus groups) is summarized under the relevant theme. For example, a table can be created with each theme in a column and each data source in a row, and researchers can then populate the cells with relevant data extracts or notes. These charts provide a visual representation, allowing researchers to easily see patterns or discrepancies in the data.

Mapping and Interpretation: With the data systematically charted, researchers can begin to map the relationships between themes and interpret the broader implications. This step is where the true essence of the research emerges, as researchers link the patterns in the data to the broader objectives of the study.

Framework analysis is an involved process, with intentional decision-making at every step of the way. As a result, implementing structured qualitative methodologies such as framework analysis requires patience, meticulous attention to detail, and a clear understanding of the research objectives. When conducted diligently, it offers a transparent and systematic approach to analyzing qualitative data, ensuring the research not only has depth but also clarity.

Whether comparing data across multiple sources or drilling down into the nuances of individual narratives, framework analysis equips researchers with the tools needed to derive meaningful insights from their qualitative data. As more researchers across disciplines recognize its value, it stands to become an even more integral part of the research landscape.

### 3.6 Benefits

Putting more time into specifying the model, using a wider range of literature, and gaining the views of a wider range of stakeholders may all be important in improving the legitimacy and validity of any ensuring synthesis Dixon-Woods (2011).

*One possible reason for framework analysis' popularity is its potential for predictability and efficiency. When paired with a targeted research question and similarly targeted data, framework analysis can be accomplished quickly (Pope et al., 2000). The explicit steps already built into framework analysis can provide clear structure for and boundaries on the analysis. Framework analysis' straightforward and systematic approach can also allow for easy entry for novice researchers and ease of use in multi- disciplinary and mixed-methods research teams (Gale Goldsmith (2021)*

*Qualitative researchers use framework analysis for a variety of additional reasons beyond ease of use. Framework analysis can be successfully used for analyzing large, complex qualitative datasets, such as can occur in policy research across multiple jurisdictions or geographies. Framework analysis can be used to methodically describe a population of interest including the notable variation contained within that population. Researchers can also use framework analysis to push beyond a thematic description of a phenomenon to the development of multi-dimensional typologies or theory development. Regardless of the purpose for which framework analysis is employed, systematic movement through the steps of framework analysis naturally provides an explicit audit trail (Parkinson et al., 2016; Smith & Firth, 2011). The methods and results of framework analysis can also be presented in transparent and accessible ways for a variety of audiences, meeting the dependability and credibility needs of applied researchers and applied research funders (Ritchie & Spencer, 1994).@goldsmith2021using*

*While framework analysis can be simple and straightforward under the right conditions, framework analysis is not inherently simple, quick or undemanding. Researchers undertaking framework analysis, for instance, must be prepared to work both systematically and dynamically (Ritchie & Spencer, 1994). Goldsmith (2021)*

*Framework analysis' demand for structure and order pushed the TBA dataset analysis beyond the simple listing of themes, which further benefitted the comparison between stakeholder groups. The charting and mapping demands of framework analysis also meant that each theme was reviewed for each stakeholder group, highlighting variation between stakeholders and helping to surface policy- relevant silences in the data. The results of this framework analysis then helped identify gaps needing bridging before expecting stronger working relationships between TBAs and formal health care workers.@goldsmith2021using*

*The benefits of framework analysis' order and structure can extend beyond the study completion. As already mentioned in the introduction, the explicitness of the steps of framework analysis provides an easily understandable audit trail and provides non-research audiences access to the inner workings of the analysis. Such transparency can increase the willingness of policy makers, the public, and other knowledge users to engage with and use the research to understand*

and solve policy problems. Framework analysis' transparency can also be harnessed for future qualitative, quantitative, and mixed methods research. @goldsmith2021using

*I add my voice to others in demonstrating that framework analysis is both a powerful and flexible method for analyzing a variety of types of qualitative data, including secondary data. The examples in this paper and elsewhere show that framework analysis has been effectively used by solo researchers, by teams of qualitative researchers, and by multi-disciplinary and mixed-methods research teams. There are myriad reasons for applied researchers to use framework analysis, including transparency of process and a long and successful track record for better understanding of policy issues and social problems to help policy makers, service deliverers, and other knowledge users with improving program design and decision making. Results from applied research studies using framework analysis have also contributed to better theorizing about phenomena of interest and improvements in the design of future research of any type, whether that future research is qualitative or quantitative, or basic or applied. In sum, framework analysis has value to applied fields and beyond. I hope this paper encourages applied researchers to consider using framework analysis and to employ framework analysis with confidence and rigour. Goldsmith (2021)*

*It is not aligned with a particular epistemological viewpoint or theoretical approach and therefore can be adapted for use in inductive or deductive analysis or a combination of the two (e.g. using pre-existing theoretical constructs deductively, then revising the theory with inductive aspects; or using an inductive approach to identify themes in the data, before returning to the literature and using theories deductively to help further explain certain themes). - It is easy to identify relevant data extracts to illustrate themes and to check whether there is sufficient evidence for a proposed theme. - Finally, there is a clear audit trail from original raw data to final themes, including the illustrative quotes Gale et al. (2013)*

*The process enables the researcher to track decisions which ensures links between the original data and findings are maintained and transparent. This adds to the rigour of the research process and enhances the validity of the findings Smith and Firth (2011)*

### **Purpose of 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. Cornet and Gudmundsson (2015)
- Comparative analysis based on the meta-framework could identify common features and gaps, and be used as **a basis for testing hypotheses** regarding how indicators influence decisions on option generation, design, operation, maintenance and other aspects of transportation systems. Eventually it should help evolve sustainability measurement in transportation planning from a position as a niche, ad hoc, or add-on activity into

something like an “Organizing Principle for Transportation Agencies”, as it has recently been formulated (21). Cornet and Gudmundsson (2015)

- Therefore, rather than a ‘recipe’ to be applied directly by agencies, the meta-framework is first and foremost a scheme for further empirical analysis of existing frameworks. The next step is to refine and apply the criteria via empirical analysis of how frameworks have been developed and used in real world conditions. Eventually this will allow for building a robust set of criteria based on theory as well as realism Cornet and Gudmundsson (2015)

*Methodologically the authors found this “best fit” approach to framework synthesis, as developed and tested in this review, to be a useful, fairly rapid and reliable and, above all, pragmatic method of synthesising qualitative data. This “best fit” approach to synthesis was therefore found to work well overall, particularly within the role previously identified as an existing strength, namely for testing existing potentially generalisable theories and models within a specific context. However, such a “best fit” approach would benefit from further testing and refinement. @carroll2011worked*

*The authors suggest that this “best fit” approach occupies a pragmatic middle ground between grounded theory-type and framework based syntheses and acknowledge the need for further evaluation carroll2011worked*

### 3.7 The pearl-growing technique

It is a method used in qualitative research to identify additional sources of information or relevant studies based on the references, citations, or recommendations found in already identified sources. The name “pearl-growing” metaphorically refers to the process of gradually accumulating valuable “pearls” of information as researchers expand their search based on leads found in the initial set of sources.

Here’s how the pearl-growing technique typically works:

**Initial search:** Researchers begin by conducting an initial literature search using databases, search engines, or other sources to identify relevant sources related to their research topic.

**Review of references:** Once relevant sources are identified, researchers carefully review the reference lists or bibliographies of these sources. They pay particular attention to the sources cited within the papers, as well as any recommended readings provided by the authors.

**Identification of additional sources:** Researchers then use the references found in the initial set of sources to identify additional studies, articles, books, or other materials that may contain relevant information or contribute to their understanding of the topic.

**Iterative process:** The process of reviewing references and identifying additional sources is iterative, meaning that researchers continue to expand their search based on the leads found in



each round of searching. This process may involve reviewing the references of newly identified sources and repeating the search until saturation is reached, meaning that no new relevant sources are being found.

Evaluation of relevance: As new sources are identified, researchers evaluate their relevance to the research question or objectives. They consider factors such as the alignment of the content with the research topic, the quality of the source, and its potential contribution to the overall understanding of the topic.

Incorporation into the analysis: Finally, researchers incorporate the findings from the additional sources into their analysis or synthesis of the literature. They integrate these new insights with those obtained from the initial set of sources to develop a comprehensive understanding of the research topic.

The pearl-growing technique is valuable for ensuring that researchers identify a diverse range of perspectives, theories, and findings relevant to their research topic. By systematically expanding their search based on the references found in already identified sources, researchers can enhance the depth and breadth of their literature review and increase the likelihood of identifying important insights and contributions to the field.

*The methodology uses the bases of a meta-theory and meta-history, parting from a seminal work in that of Marshall. From there the author draws and follows a timeline with which a progress in the motivations and contributions made by biology in economics and business studies can be traced. - How a seminal work is defined? - How the author decides to entertain around a certain seminal work and the works around it?*

*The meta-analysis is nit exhaustive not complete, The conclusions are extracted once saturation is achieved Barnett-Page and Thomas (2009).*

*Paterson et al described meta-synthesis as a process which creates a new interpretation which accounts for the results of all three elements of analysis; however, they do not make it clear exactly how all three components of analysis are brought together to achieve this „new interpretation“.*

### **3.8 Differences with systematic review**

Meta-synthesis and systematic literature review are both methods used in qualitative research to synthesize findings from multiple studies, but they differ in their objectives, approaches, and synthesis techniques. Here are the key differences between meta-synthesis and systematic literature review:

- 1. Objective:**

- **Meta-synthesis:** The primary objective of meta-synthesis is to integrate and interpret qualitative findings from multiple studies to develop new understandings, theories, or conceptual frameworks. Meta-synthesis aims to generate insights that go beyond the individual studies and provide a deeper understanding of the research topic.
- **Systematic literature review:** The primary objective of a systematic literature review is to provide a comprehensive overview of the existing literature on a particular topic. It aims to summarize and critically evaluate the findings of relevant studies, identify gaps or inconsistencies in the literature, and provide a synthesis of the current state of knowledge.

## **2. Approach:**

- **Meta-synthesis:** Meta-synthesis typically involves a qualitative analysis approach, where researchers extract, analyze, and interpret qualitative data from multiple studies. It often involves thematic analysis, constant comparison, or other qualitative synthesis techniques to identify common themes, patterns, or concepts across studies.
- **Systematic literature review:** Systematic literature reviews can involve both qualitative and quantitative research methods, depending on the nature of the research question and available literature. They follow a systematic and transparent process for searching, selecting, appraising, and synthesizing studies, often using predetermined criteria and structured data extraction forms.

## **3. Synthesis technique:**

- **Meta-synthesis:** In meta-synthesis, researchers synthesize qualitative findings from multiple studies to develop new interpretations, theories, or frameworks. This synthesis may involve identifying common themes, patterns, or concepts across studies, as well as exploring relationships, contradictions, or divergent perspectives within the data.
- **Systematic literature review:** In a systematic literature review, the synthesis may involve summarizing and categorizing the findings of included studies, identifying trends or patterns in the data, and providing a narrative or descriptive synthesis of the literature. The focus is on summarizing and synthesizing existing knowledge rather than generating new interpretations or theories.

## **4. Output:**

- **Meta-synthesis:** The output of a meta-synthesis is often a synthesized framework, model, or theory that integrates findings from multiple qualitative studies. This output provides a deeper understanding of the research topic and may generate new insights or perspectives.
- **Systematic literature review:** The output of a systematic literature review is typically a comprehensive summary of the existing literature, including key findings, trends, gaps, and recommendations for future research. It provides a snapshot of

the current state of knowledge on the topic and may inform practice, policy, or further research.

In summary, while both meta-synthesis and systematic literature review involve synthesizing findings from multiple studies, they differ in their objectives, approaches, synthesis techniques, and output. Meta-synthesis aims to develop new interpretations or frameworks based on qualitative data, while systematic literature reviews provide a comprehensive overview of the existing literature on a topic.

### 3.9 Similarities with other quality approaches

*The Framework Method sits within a broad family of analysis methods often termed thematic analysis or qualitative content analysis. These approaches identify commonalities and differences in qualitative data, before focusing on relationships between different parts of the data, thereby seeking to draw descriptive and/or explanatory conclusions clustered around themes* Gale et al. (2013)

- Thematic analysis Stevens (2023) for Boyatzis, the aim of a TA is not only to identify themes, measure their frequency (e.g., by number of cases), or cluster them in groups, but also to detect relationships among them. You might therefore start by trying to understand if there is a relationship among specific themes and what type of relationship that is. Once you identify a relationship among themes, you formalize this relationship into a meta-theme. If two or more themes are brought together in a meta-theme, you will then aim to understand what that meta-theme is about and interpret how it might help you to further understand the phenomenon that you are studying

*Framework analysis is an inherently comparative form of thematic analysis which employs an organized structure of inductively- and deductively-derived themes (i.e., a framework) to conduct cross-sectional analysis using a combination of data description and abstraction.* Goldsmith (2021)

*Generating themes from data is a common feature of qualitative methods and a widely used analytical method. Thematic analysis is an interpretive process, whereby data is systematically searched to identify patterns within the data in order to provide an illuminating description of the phenomenon. The process results in the development of meaningful themes without explicitly generating theory (Tesch 1990). Thematic analysis can provide rich and insightful understandings of complex phenomena, be applied across a range of theoretical and epistemological approaches, and expand on or test existing theory (Braun and Clark 2006). However, thematic analysis has been criticised for lacking depth, fragmenting the phenomena being studied, being subjective and lacking transparency in relation to the development of themes, which can result in difficulties when judging the rigour of the findings (Attride-Stirling 2001). Smith and Firth (2011)*

*The framework approach has many similarities to thematic analysis, particularly in the initial stages when recurring and significant themes are identified. However, analytical frameworks such as thematic networks and the framework approach appear to have a greater emphasis (...) on making the process of data analysis transparent and illustrating the linkage between the stages of the analysis (Pope et al 2000, Ritchie and Lewis 2003, Braun and Clark 2006). Central to the analytical processes within the framework approach is a series of interconnected stages that enables the researcher to move back and forth across the data until a coherent account emerges (Ritchie and Lewis 2003). This results in the constant refinement of themes which may lead to the development of a conceptual framework. Smith and Firth (2011)*

- Content analysis Stevens (2023) ‘research technique for the objective, systematic and quantitative description of manifest content’
- Meta-synthesis

### **3.10 3.2 Structured Review of Key Existing Frameworks**

*As can be seen from the above, assessing skills/competence frameworks is not a simple task.*

*In this situation the Workshop has examined tools that can help in the structured review of what is currently available. These tools are essentially of two kinds:*

- “top-down” approaches, where the main characteristics of the different frameworks are presented in what might be viewed as a structured inventory – drawing on Dutch experience with the Generic Referential ICT Profiles (GRIP) approach (Hacquebard, 2005) , and
- “bottom-up” approaches, where each profile specification is analysed in terms of the underlying units of competence, skills and knowledge (the e-Competences and Certifications Observatory (eCCO) project, researching the use of “Knowledge Objects” as the “underlying unit”, leads developments here). A summary of the principles of the eCCO approach is presented in Annex G.

*This CWA uses the Top-down approach, but supports the development of complementary Bottom-up approaches as potentially providing more rigorous analysis for comparison and design. In particular completion of the eCCO approach in this regard is awaited with interest European Committee for Standardization (2006)*

## 4 Description

*It is clear that positive education will benefit from the development of meta-frameworks to guide research and practice. To this end, the first author of this paper has been involved in a multi-year programme of research to develop a data-driven, meta- framework in positive education - the SEARCH framework. SEARCH has been developed to help researchers organize current scientific findings and to advance future research. The framework is also designed to help (...) Waters and Loton (2019)*

*SEARCH is a new meta-framework that is higher-order in nature, evidence-based, actionable and multi-dimensional. SEARCH was developed through two key stages of research. Stage one involved a large-scale, ‘birds-eye’, review of the science of positive psychology in order to determine the key pathways of positive functioning/ well-being (Rusk and Waters 2015). Stage two involved road testing the pathways identified in stage one via action research in ten schools. Both of these stages will be now be described.@waters2019search*

*With regard to stage one,(...) Findings revealed five over-arching pathways: 1) virtues and relationships, 2) emotional management, 3) attention and awareness, 4) comprehension and coping and 5) habits and goals. These five pathways formed the first iteration of the positive psychology (PP) framework Waters and Loton (2019)*

*(...)At the completion of stage one and two the six pathways comprising the framework were established. By taking the first letter of each pathway, the acronym SEARCH was created, and Fig. 1 visually depicts the six pathways of the SEARCH positive education framework.@waters2019search*

### 4.1 SEARCH: A Systematic Review

*Following the development and refinement of SEARCH as a meta-framework for positive education, the focus of the current paper is to conduct a systematic review of the educational literature to examine evidence of the six pathways in student samples and consider the ways these pathways can be increased in students through existing school-based interventions to boost wellbeing and academic achievement.@waters2019search*

*The current review paper was guided by the three below questions, for each of the six SEARCH pathways*

1) What evidence is there to indicate that the intervention boosts the pathway it is targeting? For example, do mindfulness interventions actually boost attention and awareness? 2) What evidence is there to indicate that the intervention builds wellbeing? 3) What evidence is there to indicate that the intervention improves school-based and academic outcomes? Waters and Loton (2019)

5. *CROSS-STUDY SYNTHESIS* 5. *Cross-study synthesis* Having reviewed systematically the views of children, young people and parents about walking and cycling as a means of transport, we compared these views with evidence derived for the review by Ogilvie and colleagues (2004) of the effects of interventions promoting walking and cycling as a means of transport. Implications for interventions highlighted by our views synthesis were entered into a matrix alongside the included and excluded evaluations of interventions from the review of intervention effectiveness by Ogilvie et al. (2004). This table is provided in Appendix 8. We then examined the matrix to determine whether interventions matched, contradicted or simply failed to address children's, young people's or parents' views. Theme 1: Culture of car use Brunton et al. (2006)

*Reflections on the framework and its value* The framework we developed and have described in this paper is comprehensive in its scope. It accommodates diverse methods for public involvement in research, operating at international, national, regional and local levels, in urban and rural areas, stretching across the developed and developing world, and in contexts that differ widely in terms of topic of interest, organizational structures and underpinning theories. The framework draws together examples of public involvement that share fundamental principles, but that have developed in very different contexts (such as participatory research with Californian young people and with farmers in developing countries). Oliver et al. (2008)

*It distinguishes between variables operating at different levels; at initiation, and subsequent choice of participants, forum and decision-making processes. It juxtaposes public involvement methods that share characteristics along one or more dimensions. Application of the framework facilitates the identification of general trends (such as collaborative relationships being more productive), and highlights exceptions (such as tokenistic committee involvement) to deepen our understanding of public involvement processes and increase progress towards more productive methods of public involvement.* Oliver et al. (2008)

*A particularly fruitful method for involving the public in setting large-scale research agendas appears to be a combination of collaboration and consultation, with lay people taking leading roles in consulting their peers. Another advantage of our framework is that it exposes important gaps in the existing literature, most notably about methods for collective decision making, which are rarely reported in detail.* @oliver2008multidimensional

*our framework was constructed from a combination of a priori issues, the information needs of the study set by the funders, and issues that emerged from the data. The dimensions of the framework emerged from our personal experience, from the background methodological literature, and from the empirical or reflective reports that provided the data of the review. As with much primary qualitative research, the framework was not identified until we were familiar with the literature as data, and it was instrumental in helping us code and organize*

*the data, then describe and interpret the concepts. This approach allowed comparative analysis of varied and complex methods and the identification of gaps, whether these were gaps in individual reports (such as little description of methods, even less of public views and influence) or gaps in our collective knowledge, in particular, about methods for reaching decisions with patients /publics. Oliver et al. (2008)*

*Our framework allowed the abstract concept of empowerment to be addressed in very practical terms: the numbers of people involved; whether they were individuals or networked group members. Oliver et al. (2008)*

It is important to clearly establish the differences that distinguish an evolutionary process from another of change or transformation. Although these are related concepts in evolutionary theory, they actually denote different processes that act on different agents, which is why they tend to be confusing even among some specialists.

Evolution is an overarching process that drives change in populations over generations. This means that evolutionary processes do not operate at the level of a specific individual or organism, which would only change or transform. Evolution therefore represents the cumulative effect of the inherited changes made by the characteristics of the individuals of a population, on which a selection process operates affecting the frequency of traits within a population over time. Change encompasses a broad spectrum of morphological or behavioral alterations within individuals from a variety of factors, including environmental pressures and reproductive patterns. Transformation suggests more profound or significant shifts in form, structure or function of individuals.

The idea of individualism is confronted with that of populationism. Darwin's theory is a mix of both: natural selection operates at the level of the individual organism, regulating the frequencies of traits within a population over time. Populations are the units of evolution.

Another important approach to take into account is the one that confronts the idea of evolutionism with that of progressionism. The first refers to a change that is non-directional, while the second implies a direction in evolution, usually following a teleological change.

## 4.2 Evolution

A simple evolutionary framework works like this:

Sudden or slow changes in the environment trigger a response in the organism that involves an adaptation, which means the loss, modification or creation of new individual traits. When the new traits are incorporated into the genetic variation of the population, the process of natural selection operates to favor some over others and derive a greater or lesser reproductive advantage to those individuals that have incorporated those new traits. This favoring or penalizing process carried out by the environment determines the greater or lesser ability of an organism to survive. This favoring or penalizing process carried out by the environment

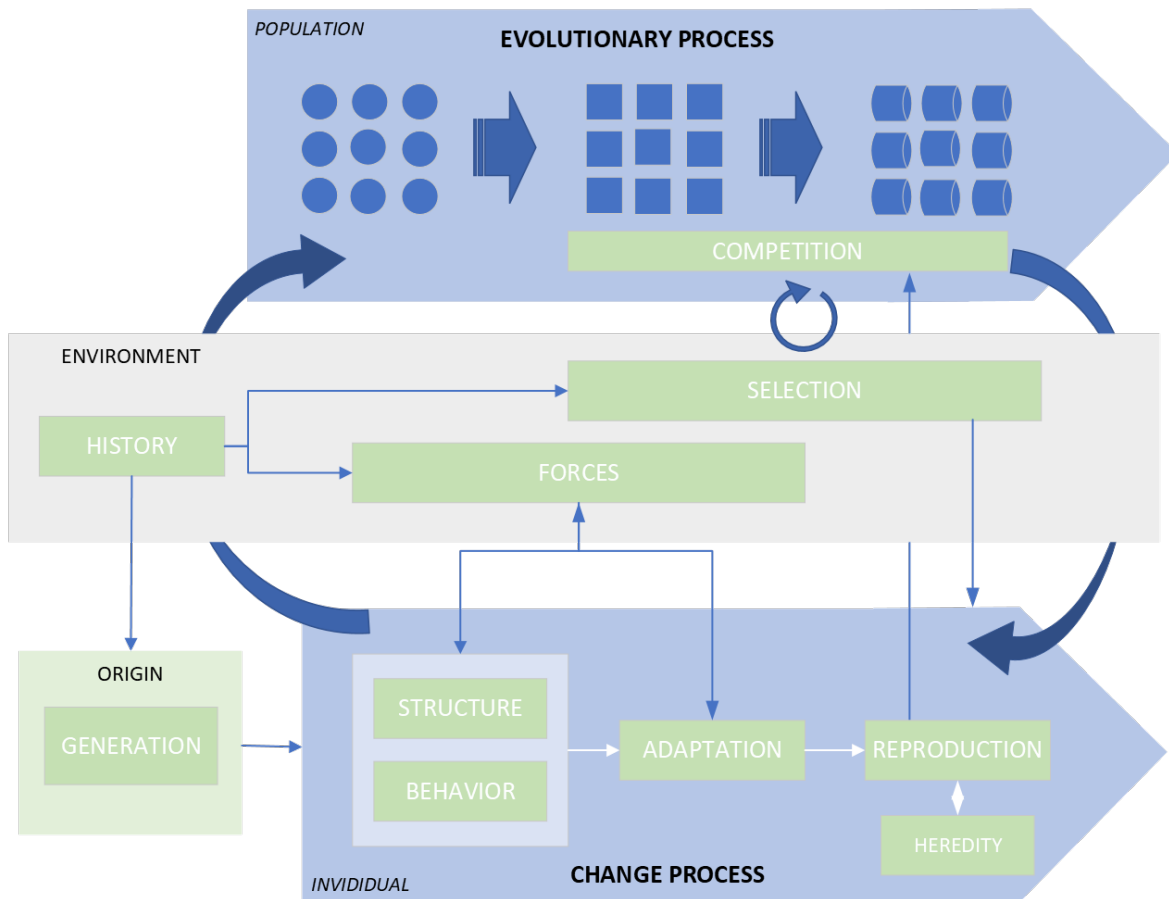


Figure 4.1: Fig1. Framework for evolutionary systems analysis. Source: own elaboration



determines the greater or lesser ability of an organism to survive. At the end of the process the frequency of advantageous qualities (which are those that offer a greater ability to survive) will be higher, and those that offer less ability to survive have a lower frequency.

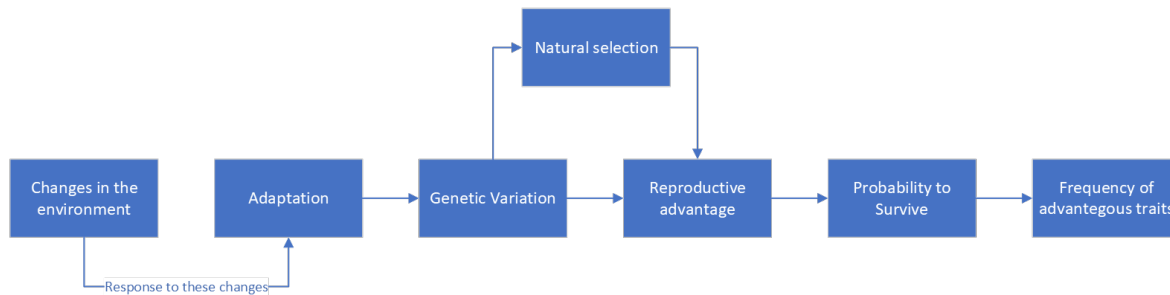


Figure 4.2: Fig2. Simple evolutionary framework

In the process of evolution is worth consider the role of feedback loops between mental an social evolution (as imagined by H.Spencer). For this author a more complex society is a stimulus for more mental development. This is the foundation of evolutionary psychology and of sociobiology.

How is the mechanism of evolution: cyclic vs. continuous?

The role of the organism to focus in new habits and become an active creative agent in charge of its own destiny is an idea of H.Spencer. This takes the evolutionary analyst to think about the role of knowledge and learning to change habits and create new instincts, in the end, to unfold a process of self-improvement (which is Lamarckian).

Study of the role of innovation and learning, and of free enterprise of individuals to cope with a competitive environment (H.Spencer). Linked to the above is also the discussion about the role of the government and the state as instruments that affect the environment.

### 4.2.1 Competition

The evolutionary analyst must understand competition as that within an ecology based on struggle. These are three fundamental terms to understand the evolutionary analysis framework.

It is important to stop for a moment to understand the implications of the concept of ecology to explain an evolutionary system. To achieve this, a common approach has been to use biogeography as a way of knowing about the spread of relationships and how species compete to occupy territory.

### 4.2.2 Convergent evolution (parallelism)

This conception of the evolutionary process implies the existence of a parallelism between independent evolutionary trajectories.

The environmental challenges over species A and B, make those species develop the same structures and behaviors, which may have an impact on morphology, physiology, and life history traits. This continues forward with the same genetic pathways (even the same phenotypic traits), the consequence being on predictability/replicability of evolution, namely, the same solutions given to similar selective pressures.

This opens the debate between uniformitarianism (and gradation) vs catastrophism. The former is Lyell's idea of the same processes of change today than ever. The latter is about sudden changes, such as catastrophic events. ### Lamarckian approach The Lamarckian approach to evolution is based on the changes posed by the environment that determine (influence) the needs of organisms. These needs, when varying, affect the degree of use or disuse of certain organs (as is the case of a giraffe) and hence the greater or lesser development of certain parts of the body. This greater or lesser development of the parts of the body in turn affects the size and power of the organism's organs and, ultimately, the organism's ability to be preserved through reproduction.

### 4.2.3 Buffon's perfect adapted organism

According to this framework of thought, only when alterations in the environment occur, due to alterations in climate or geography, do variations appear. This is the moment when natural selection operates to adapt the species to new conditions.

Environmental stressors cause the perfectly adapted organism to begin a process of degeneration and lose its original adaptability and perfection. This process that takes place over time gives rise to intermediate or transitional forms, which ultimately explain the diversity of life on earth.

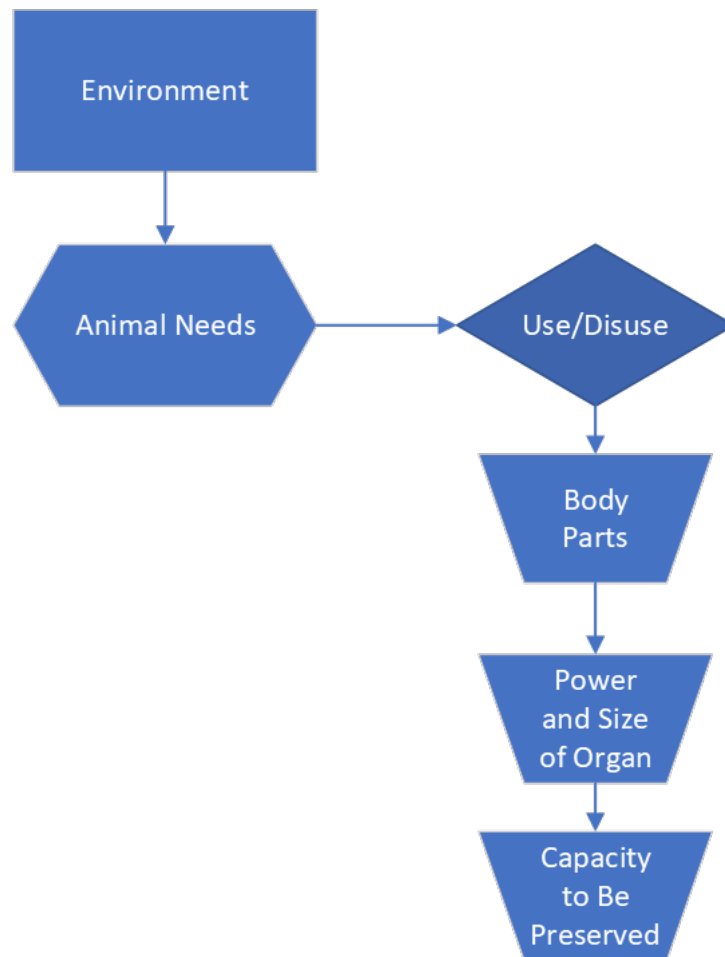
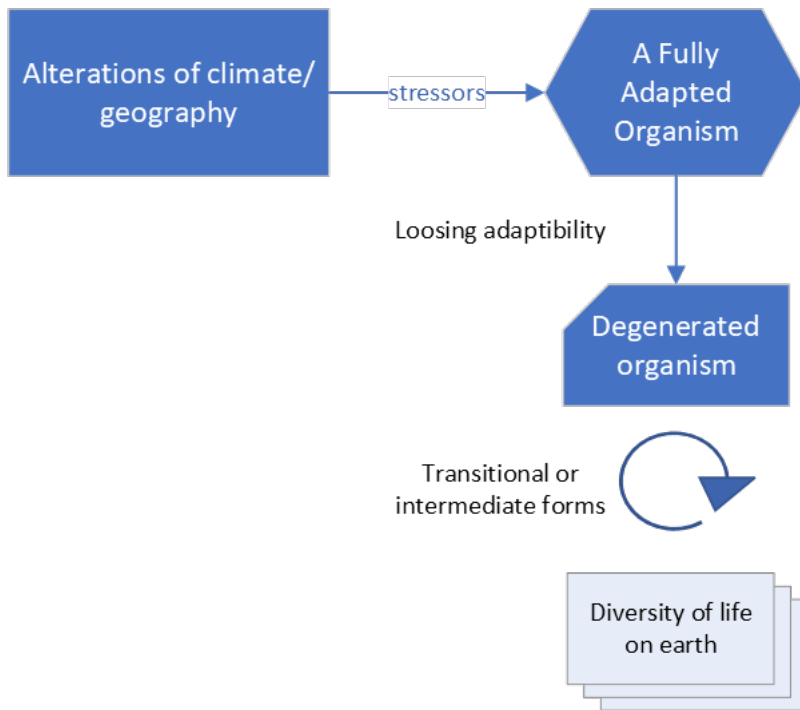


Figure 4.3: Fig2. Lamarckian evolutionary framework



### Spencer's framework

Herbert Spencer's analytical framework establishes that new situations in the environment give rise to organisms having to learn how to cope with them. From this learning is derived the development of new instincts, which are more complex human faculties, which allow the organism to be more prepared to face the "survival of the fittest."

## 4.3 Origin

The problem of the origin is associated with that of the "Problem of Generation" and its accompanying theories of generation. An analysis of the origin involves the need to explore for evidence of the past in search for a better system (what are the sources of evidence?).

The following are some of the theories to consider when addressing the problem of generation of the original structure:

- Spontaneous generation (often only for the simplest forms)
- Preformationism (forms that are predetermined)
- Pre-existence
- A mold that is fixed.

After the evidence of generation has become evident, the next step is to continue understanding the trend towards higher levels of complexity, and the material forces that have an influence on the trend.

When the evolutionary analyst deals with the problem of generation she must attend to the *developmental process*, and the constraints that it can impose on the rest of the evolutionary process. These constraints might introduce non-random variations, which can mean a way to direct the course of evolution.

It is especially useful for the evolutionary analyst to consider that the unit (species) has a limited number of developmental pathways available and that the selection process would therefore be limited only to the possibility of tinkering with the details.

## 4.4 Structure

The main issue when considering Structure is to establish what the analytical unit of the system is (and what its main basic components are). In the case of natural evolutionary theory, this unit has traditionally been the organism, but also the population and later, after modern synthesis, the gene. It is the analyst's job to determine as clearly as possible which is the "unit" on which the evolutionary analysis of the system will focus.

Thinking about population opened the door to a statistical model of explanation, which is opposed to the Newtonian view of law-based causation. This is the eternal debate between determinism and probabilism.

## 4.5 Environment

What is the role of the environment as a key impact driver?

The environment surrounding the chosen unit of analysis exerts various types of forces that act on the structure to provoke a process of change, with greater or lesser intensity, and in one direction or another.

The forces of change originating in the environment force the unit to change, so it is essential that the analyst analyze the environment in depth as a key impact driver, understanding the role of the environment in the evolutionary process of the system.

The connection between the environment and the origin is a key issue as well, since the direction of the change, if it exists, and the intensity or depth of the change that may take place in the structure of the unit may sometimes depend on it.

This opens the debate between directionalism vs catastrophism in change. The latter is a random process of a destructive-creative type, in which change occurs in discontinuous steps

and not through a gradual modification. The above opens the debate over purposeful changes (goal directed with no fixed line of advance- H. Spencer). The “struggle for existence” (Malthus) and the “survival of the fittest” (spencer).

One result of this view is whether evolution is linear (represented by a ladder) vs a tree (the idea of branching).

#### **4.5.1 History**

The system as the outcome of historical forces (Montesquieu).

The evolutionary analyst should elucidate whether the same forces of the past are those that govern the forces of today.

...And the vision of progress with phases of equilibrium as the whole moved from homogeneity to heterogeneity (E.Tylor)

(From Change) A good question to be reviewed by the evolutionary analyst: Is change a staged process, a process depending on historical forces?

#### **4.5.2 Forces**

It is important when analyzing the environment to specify the type of force applied to the structure, and its sources in said environment.

The forces that operate to produce evolutionary changes can be:

1. Mutation
2. Natural selection
3. Genetic drift

Following another typology of change forces (which should be clarified):

1. Hybridization
2. Recombination
3. Superposition

### 4.5.3 Selection

Is (natural) selection an episodic or a continuous process?

Are there periods of stable life where (natural) selection does not operate? or, Is (natural selection) always operating even in a stable environment?

A related approach is the one which considers selectionism vs. saltationism, and the extension with the role of mass extinctions. This would open the debate about evolution not always being progressive, and the acceptance that species could degenerate in less challenging lifestyle.

Is the (social) behavior programmed into us by natural selection? This would take us to the question of the development of social instincts.

The idea of struggle and death might have a positive purpose to keep species well adapted to a challenging environment (this is an utilitarian perspective). They might have a creative role (along with sex reproduction). Utilitarianism in behavior and change/adaptation can be seen in J.S. Mill and W.Poley.

How evolution can produce advance in several directions (and not only towards humanity)?

The notion of selection used in this paper is that of having a balance between different characters within a population and not about the development of a murderous or aggressive instinct.

## 4.6 Behavior

Behavior is the way in which the structure articulates a response to the pressure exerted by environmental forces. Behavior establishes the boundaries within which the structure is capable of absorbing the forces of the environment and giving an adaptive response to the new situation or challenge posed by the environment.

The result of the behavior, which takes place within the boundaries established by the structure of the unit, can give rise to three types of adaptive responses by the system:

- New system qualities (traits)
- Loss of system qualities (traits)
- Modification of system qualities (traits)

What types of evolutionary behaviors can we find?:

1. Cyclical
2. Linear
3. Random

Another way to

## 4.7 Change

Both the structure and the behavior are permanently immersed in a process of change, since the unit is always sensitive to the forces exerted on it originating in the environment. The overall evolutionary process of the unit will depend on the way in which these forces affect the unit.

The characterization of the change process must be carried out considering the following key dimensions, all of them closely related:

1. The direction or trend of the change process. This question has historically been part of the discussion on evolutionary theory, with different approaches given by different authors.
2. The change driver, whether it is a single one or a set of drivers that configure the change process. This opens the debate between configurable versus non-configurable change or, in other words, whether change is manipulable (Lamarckian) or non-manipulable (Darwinian).
3. The mechanics of the process, whether gradual and slow, or sudden/abrupt and in jumps, or any intermediate alternative in the continuum formed by these two extremes.
4. The time scale on which the change process takes place. This can develop over a vast amount of time or a small amount of time, or somewhere in between.
5. Open-ended process based on trial-and-error vs. directed (fixed) process

Some important considerations to keep in mind are that the process of change always implies progress, but it can also involve regression. Therefore, the evolutionary analyst faces both forward and backward movements. This goes hand in hand with the idea of continuous progress, as opposed to progress in jumps or saltation.

A good question to be reviewed by the evolutionary analyst: Is change a staged process, a process depending on historical forces?

What is the role of the state of technology to explain the change process, and that of diffusion of knowledge?

Be aware that the process of accumulation of change can lead to the formation of new organs (new structure), according to E. Darwin.



### 4.7.1 Mutations

Mutations play a role in the process of change, specifically they provide a source of random variation, but they do not generate new species. Mutations generate variation and natural selection then shapes the distribution of traits within a population over time.

It must be taken into account that not all genes that undergo a mutation produce drastic changes in the organism (individual); in reality, most mutations are neutral and do not produce noticeable changes. The evolutionary analyst will have to take into account that the environment plays a role in determining which mutated characters are those that spread in the population (this is nothing more than the phenomenon of selection).

Maybe the concept of mutation is for more drastic transformations leading to new species, accepting that adaptation and selection might be irrelevant.

Can the evolutionary analyst evaluate the idea that there might be internal forces generating characters unrelated to the organism's needs? A related consideration may take us to consider that evolutionary changes occur in a predetermined manner driven by internal factors (this is called "directed evolution"). This is what has historically been called orthogenesis (F.Eimer).

The above opens involves fixity of direction, and if variation is also considered as not random, therefore there is no need for adaptation. According to this vision the environment would not have any role in evolution. Evolution might come to happen beyond what is functionally needed and not because environmental factors.

Does "**overdevelopment theory**" apply (A.Hyatt)?

## 4.8 Reproduction

Currently there is a generalized consensus in accepting the reproductive success of the unit as the main driver of selection, that is, the ability to transmit the genetic load of the unit to the offspring (this perspective has been criticised by Stephen Jay Gould). This modern vision of evolution has not always been like this, so less than 100 years ago success was considered to be found in the ability to adapt to the environment.

Selection based on reproductive success has opened the doors to new avenues of interest and study, which now focus more on sexual selection, in the case of natural systems, or on the reproduction mechanisms of any other system. An interesting factor that every evolutionary analyst may want to analyze is the role of geographic barriers to explain the way in which species multiply.

Let us also think that the selection process that takes place in the environment is continuous and is not interrupted even when the environment is stable. In other words, competition between some units and others for scarce resources never stops, even if the environment appears stable. The analogy of the Red Queen hypothesis, introduced by Van Halen Van Valen (2014)

to denote that in the evolutionary race between organisms species must constantly adapt and evolve just to maintain their relative fitness within an ever-changing environment, it is good to explain that units must remain constantly improving or, otherwise, they will be outstripped by their rivals.

#### **4.8.1 Reproductive strategies**

What are the reproductive strategies in a population? There are a few: parthenogenesis, hermaphroditism, R-selected, K-selected, Sewel parity, itero parity, mono/poly gametes, hybridization, transmutation, pangenesis, orthogenesis.

Germ (hard heredity) vs somato plasm (soft heredity).

#### **4.8.2 Developmental constraints**

The concept of developmental constraints affects in shaping the course of evolution. This is because the embryonic development process imposes a series of limitations on the types of changes that can occur in organisms over time. Patterns and constraints of embryonic development can provide insights into the mechanisms underlying evolutionary change and diversification.

#### **4.8.3 Evo-devo approach**

This approach, abandoned by current biologists, states that “ontogeny recapitulates phylogeny”. To understand it we must apply an “evo-devo” approach, meaning that embryological processes are part of evolutionary systems. This approach presents the idea of “blending” as the most convincing explanation of reproduction.

The “evo-devo” approach is based on Von Baer’s laws of embryology, which establish the following:

1. The basic structures of the body are established before specialized features appear
2. Embryos progress from general to specific characteristics as they develop

Homology vs analogy. These concepts establish that similar structures in different organisms are derived from a common ancestor.

In the case of homology a common ancestor “A” gives rise to a divergent pattern of species “B” and “C” that are specialized and have a different formation.

The pattern in the case of analogy is convergent, since two species “A” and “B” present the same organ with the same function.

#### 4.8.4 Speciation and Specialization

The problem of speciation, that is, the division of a parent into several descendants. This is related to niche specialization and adaptation. Speciation is a fundamental mechanism of biological diversification.

Speciation leads to opportunities for specialization. Specialization within populations can contribute to reproductive isolation and promote speciation. It can also drive specialized traits that lead to divergence of populations over time.

In specialization a constant force, natural selection, determines the level of specialization, posing a pressure to specialize on species (in line with Adam Smith thought). The level of specialization influences the level of adaptation, which drives a divergent process of speciation.

**Types of specialization:** genetic, behavioral or ecological.

Role of geographical isolation of speciation There are two considerations in regards of the role of geographical isolation for speciation. One considers that specialization emerges without the need of geographical barriers, this is called sympatric speciation and is a rapidly evolving type of speciation. Whereas allopatric speciation is much less rapid and more accepted today, and considers geographical barriers at the initial stage of species separation.

### 4.9 Heredity

Heredity is an accumulated effect (think of Lamarckian IAC).

Species have a gene pool that contain a large pool of genetic variability, in which many of these genes are simply useless or harmful. This gene pool is the raw material for selection.

An important task of the evolutionary analyst will be to determine if there are modifier genes (W.Castle) that influence the genes responsible for phenotypic characters.

Some Lamarckian stances might be worth an analysis. For example, the evolutionary analyst might consider that not all inherited acquired characteristics (IAC) are inherited by or as a response to changes in the environment.

The above might take of to the question if all evolution is mere trial-and-error, and how much is a deliberate choice of new habits in response to changes in the environment? Current thinking considers that not all needs to be inherited, so (to what extent) Can the environment influence heredity? (W.Bateson). But be advised that genetics is hostile to this idea.

Mendelian rule of “one single unit” in the germ plasm being responsible for determining the character and transmitting it to offspring. This would lead us to have to elucidate which genes (alleles) are dominant and which are recessive. This would lead us to have to elucidate which genes (alleles) are dominant and which are recessive, and thus explain that there are discontinuous characters (Bateson).

## 4.10 About the Evolutionary Analysis Model

The analysis model for evolutionary analysis must balance theory with observation (Herschel). In reality, theories derive their power from their ability to establish connections with other areas of study.

(In Structure) Thinking about population opened the door to a statistical model of explanation, which is opposed to the Newtonian view of law-based causation. This is the eternal debate between determinism (causation) and probabilism (statistical).

Other discussions apart from determinism vs probabilism established by evolutionary analysis are these:

- Predictive vs descriptive
- Reductionist vs holistic
- Macroscopic vs microscopic

The method of evolutionary analysis is that of a patient observer (Darwin), who poses some hypothetical situations and then uses the deductive method to try to verify them.

## 4.11 Tables to Include: Refinement of the Initial Framework

*Table 2 Goldsmith (2021) Framework Identification (Step 2) in the TBA Dataset: Initial and revised framework for understanding the work and value of TBAs and formal health care providers in the birth process*

(ver tabla que pusieron en este paper para comparar el framework inicial y el refinado después de aplicar el framework al resto de la literatura)

Initial Framework Reasons why women use TBAs rather than formal health care providers  
Reasons why women use formal health care providers rather than TBAs  
Concerns about TBA practice  
Concerns about formal health care provider practice  
Characteristics of positive work relationships between TBAs and formal health care providers  
Characteristics of negative work relationships between TBAs and formal health care providers

Revised Framework Reasons why women use TBAs rather than formal health care providers  
• TBAs more easily affordable than health center • TBAs local while health center can be far away • TBA practice preferred over formal health care providers practice • Formal health care providers' treatment has not worked  
Reasons why women

*Figure 2: An example of the coding index (ver en Smith and Firth (2011))* Initial themes  
Initial categories

*Table 3 Goldsmith (2021)* Charting (Step 4) in the TBA Dataset: Example of data abstraction for a few key framework components and sub-components by stakeholder group for understanding the work and value of TBAs and formal health care providers in the birth process

*Figure 3: Developing the core concept, labelled uncertainty, and the final themes within the concept (ver en Smith and Firth (2011))* Initial Themes | Initial categories | Refined Categories | Final Themes | Core Concept

*Table 4 Goldsmith (2021)* Mapping and Interpretation (Step 5) in the TBA Dataset: Example of data intensity mapping for a few key framework components and sub-components by stakeholder group for understanding the work and value of TBAs and formal health care providers in the birth process

## 5 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 Arnstein<sup>9</sup> and Mullen et al.<sup>12</sup> 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.'s questions<sup>7</sup>: 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 combining the benefits of representative consultation with iterative collaboration and explicit decision making.<sup>64</sup> A comprehensive 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.<sup>65</sup> 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 evaluated 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 pathways 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)*

## **5.1 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 of research 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\**

## **5.2 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)*

## 5.3 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 of central 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 of the intervention but how that intervention can be used to build one or more of the higher-order pathways of wellbeing. For example, while (...) Waters and Loton (2019)*

*Beyond the design of individual 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)*

## 5.4 The Use of a Synthesis Method

*There are arguments about whether it is feasible or acceptable to conduct syntheses of qualitative evidence at all,<sup>41</sup> 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.<sup>43</sup> However, others point out that in primary qualitative research, definitions of the phenomenon emerge from the data.<sup>15</sup> 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.<sup>45</sup> It has been suggested that this approach would also be suitable for selecting papers for inclusion in reviews.<sup>46–48</sup> 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.<sup>5</sup> 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,<sup>14</sup> as well as those which have opted to appraise the papers using a formalised approach.<sup>22</sup> 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)*

## 5.5 Practical Implications

### 5.5.1 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 evolution-

ary 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.

### **5.5.2 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?

### **5.5.3 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.

### **5.5.4 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).

### **5.5.5 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 continue.

### **5.5.6 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.

### **5.5.7 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.

### **5.5.8 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*

## 5.6 Framework Thematic Discussion

### 5.6.1 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.

#### 5.6.1.1 Hierarchy

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

#### 5.6.1.2 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)

### 5.6.1.3 Miscellaneous

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.

### 5.6.2 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 closely 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**” (Oparin), 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.)

### 5.6.3 On the Environment

#### 5.6.3.1 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?

### 5.6.3.2 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.

### 5.6.4 On the Unit

#### 5.6.4.1 On the Structure

#### 5.6.4.2 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)

### 5.6.5 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?

### 5.6.6 On Heredity

What are the limits of heredity (change)?



## 6 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.<sup>6</sup> 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

## **6.1 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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