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# From Food to “Detoxification”: A Framework for Understanding and Shaping Social Practices and Their Networking

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**Abstract:** Understanding how social practices, like cooking, evolve and network in our daily lives is crucial for addressing sustainability and well-being challenges. While existing research prioritizes swift and holistic transformation of the network of practices, a critical gap exists in comprehending how these networks form and how they can be analyzed in practice. This study addresses this gap by introducing a novel analytical framework. This framework, which moves beyond analyzing the ‘performative’ aspects of practices (e.g., food sharing), sheds light on how interactions with objects shape and contribute to the emergence and interconnectedness of practices. By applying this framework to the case study of note-by-note cooking, we showcase its utility in three key scenarios: *Unveiling the “Why”*: Analyzing how objects become “ideologically coded” within practice networks allows us to understand the underlying factors shaping them. This empowers researchers and practitioners to identify and potentially “recode” unsustainable or undesirable practices towards desired outcomes. *Strategic Intervention*: By strategically introducing new objects into the network, the framework provides insights into “neutralizing” the influence of undesirable practices. This targeted approach allows for more nuanced interventions within existing practice networks. *Cultivating New Practices*: The framework empowers researchers and practitioners to develop or “encode” alternative practices by leveraging object–practitioner interactions. This enables the creation of entirely new practices or the expansion of existing ones, fostering positive societal transformations.



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## 1. Introduction

To successfully drive social transformations and accomplish sustainability objectives, it is imperative to understand the intricate process behind the formation of social practices. Through a thorough examination of the core foundations of practices, we can surpass the analysis of their performance and grasp the intrinsic elements that mold and uphold them. This knowledge empowers researchers and practitioners to design interventions that target the very essence of practices, fostering deeper and potentially more enduring transformations in areas like dietary habits, consumption patterns, and resource utilization. This pursuit of understanding practice formation beyond performance-dominated analyses, as highlighted by [1,2], aligns perfectly with the sustainability agenda, equipping us to address complex societal challenges through targeted interventions and fostering a shift towards more sustainable ways of living.

Food practices, due to their crucial impact on resource use and environmental sustainability, offer a powerful lens for understanding the formation of social practices in general. In line with this notion, Ref. [3] argues that food serves as a cornerstone of social interactions, making it a potent subject for studying the fundamental structures that underlie social practices. It reflects and shapes our identities, social interactions, and cultural expressions. The complex interplay between food, society, and individual experience has been examined by studies like ref. [4], highlighting the dynamic nature of food across various contexts.

Sharing food, for instance, fosters a sense of community and belonging, thus contributing to the maintenance of social structures [5]. Ref. [6] highlights the widespread agreement among social scientists that interpreting food is one of the most fundamental tasks our brains have evolved to perform. Analyzing food practices, as refs. [7,8] demonstrate, allows social practice theory to provide valuable insights into various aspects of social phenomena. This includes understanding practices within our daily routines (indicatively, refs. [9–11]), analyzing them as cultural constructs (indicatively, refs. [12–17]), discovering how to guide and influence practices [18], fostering sustainability among food industry [19], and understanding how practices vary across different contexts and occasions [20].

However, a common limitation also exists in food research: a tendency to prioritize the analysis of practices as performances, such as vegan dieting, healthy eating, and meal sharing, neglecting the underlying structures and mechanisms that shape them (indicatively, refs. [12,21–24]). This focus overlooks the “core foundations” of practices as entities. Consequently, such an analysis remains detached from the underlying structures that give meaning and direction to these practices. By neglecting the formation of practices as entities behind the performances, we also miss crucial insights into how these practices evolve and network within broader social contexts.

In response to this gap, this study presents a novel analytical framework. The model facilitates the systematic analysis of practices by examining the relationships between practitioners and the objects that constitute the practice’s “genetic makeup”, as well as the emergence of the materials, competences, and meanings (the key elements of practices identified by ref. [1]), that form the practice’s “fabric”. This perspective builds upon the established recognition that social practices are inherently intertwined with objects [25]. This recognition emphasizes the dual role of objects as both essential components and shapers of practice performativity [26]. Furthermore, objects significantly influence the emergence of networks of practices, as evidenced by studies such as refs. [8,25,27]. The exploration of sustainable global dietary practices provides a compelling illustration of how objects shape these practices and their interconnected networks. The development of plant-based meat substitutes [28] and research on inulin’s potential for sugar and fat reduction [29] exemplify this connection. These innovations not only influence dietary choices, but also necessitate the development of new competences and, potentially, redefine traditional practices. Similarly, emerging gastronomy trends like gastrophysics [30] and note-by-note cooking [31] delve deeper into the science behind food, employing specialized tools that reshape cooking practices and the way we interact with ingredients. This emphasis on the biological, chemical, and physical attributes of food [28] underscores the urgent call for food system transformation [32]. Rethinking our food selections based on nutritional value [33] and advocating for plant-based alternatives [26] further exemplifies the interplay between objects, practices, and the broader societal context.

On the other hand, while existing research often analyzes social practices as epistemic objects (indicatively, refs. [21,34,35]), our framework diverges by examining how individuals actively construct and shape their practices through interaction with food as an epistemic object (an object through which knowledge is produced and shared). This approach has the potential to provide a richer and more nuanced understanding of the factors that influence and shape social practices, especially those related to food. For example, convincing a European to incorporate crickets into their lunch routine may be difficult, but it can be achieved by preparing a pasta dish with cricket powder [36]. The acceptance of food consumption practices generally depends on various visual factors associated with the food, such as proximity, visibility, color, variety, portion size, height, shape, and surface area [37]. Our focus on objects aligns with the scientific philosophy of Nobel laureate Barbara McClintock, who emphasized the importance of developing a relationship with the object of study. Her renowned phrase, “listening to the organism”, describes her approach to understanding corn through its successive generations [38]. In this manner, we propose that, by understanding how individuals engage and learn from

food, we can gain deeper insights into the formation and evolution of food practices and their networking.

The proposed framework, merging the strengths of the two most adopted models by [1,25], empowers researchers across various fields by offering a range of valuable advantages. First, it fosters an enhanced understanding of participation and learning within specific practices. This allows researchers to delve deeper into the dynamics of how individuals engage with and contribute to the ongoing development of practices over time [39]. Furthermore, the framework enables the identification of key shifts and principles within practices and interconnected networks. This empowers researchers to track evolving trends and anticipate potential future developments [40]. Additionally, it provides in-depth insights into how elements like materials, competences, and meanings [1] interact to shape existing and novel practices within a broader societal context (indicatively, ref. [26]). Finally, the framework facilitates the investigation of how various factors, like cultural adaptation, influence the transformation of social practices, building upon work by studies such as [41].

To illustrate the use of the framework, we present evidence from note-by-note (NbN) cooking practices generated by French physical chemist Hervé This in 1994. Within an evidence-based practice approach, we exemplify how practitioners' engagement with food systematically leads to the formation of distinct practices within existing networks or the creation of novel ones.

## 2. Literature Review

### 2.1. The Elements of Social Practices

Practice is “a bundle of activities, that is to say, an organized nexus of actions” [25] (p. 71). A practice comprises (i) general understandings, (ii) rules, (iii) practical understandings, and (iv) teleoaffektive structures, which encompass ends, projects, and tasks [25]. The first three elements are grounded in the normativity of teleoaffektive structures within communities of practice [25,42]. Normativity refers to how practitioners decide to carry out practices according to what is acceptable or obligatory for them in the teleoaffektive structure of a practice [25]. According to [25], a teleoaffektive structure is composed of a spectrum of normativized and hierarchically ordered ends, projects, and tasks. Ends that individuals should or may pursue, projects they should or may undertake to achieve those ends, and tasks they should or may undertake to achieve those projects. Teleoaffektive structures play a crucial role in organizing the execution of a practice by defining its objectives and rationale [43]. They act as a strong cohesive force that unites general understandings, practical understandings, and rules, allowing practices to evolve. They are instrumental in giving practices their unique shape and distinctiveness [44].

The major research primarily uses the three-element model of [1] to analyze practices in the field of food studies [15,21,23,45]. In the model, there are first the *materials* (whats) as disincentives and enablers for practitioners, which involve things such as kitchen equipment, technical means and other material artifacts; second, *competences* (hows) as practical understandings that lead to cognitive and physical abilities; and third, *meanings* as the value patterns and belief systems that serve to explain the whys of any given practice [1,23].

When analyzing social practices in depth, it is important to distinguish between practices as entities and practices as performances [1,25]. Practices as entities can be defined as structures that develop their own dynamics and become so deeply embedded that they are perceived as entities in their own right, capable of existing independently from the individuals who originally initiated them [1,7,25,46]. Food customs that have been neglected over time, yet remain recognized, like those documented in historical texts, serve as a clear illustration of this concept. In contrast, a practice as a performance can be defined as a performative style of practice by particular practitioners [47]. For example, while a classic pizza is served on flat, open bread, a calzone pizza features closed dough, holding similar ingredients.

In addition to the limitations of studies referring to this distinction (indicatively, refs. [7,15,21]), available research primarily focuses on the analysis of practices as performance. To conduct a thorough and holistic analysis of social practices, we need a starting point from which we can understand where practices converge and where they diverge as entities and performances unfolding within socio-historic patterns across space and time [21]. For such an analysis in food research, in our framework, we propose starting with tracing how the exploration of foods as epistemic objects unfolds among the practitioners. This is especially important considering ref. [35], which highlights the significant contribution of the epistemology of practices in food studies. In this manner, we agree with the central notion of cultural and historical activity theory that all social and material practices originate from a specific object that “inspires and leads actions, upon which activities are coordinated, and in which activities are concentrated... when the activities are accomplished (p. 66)” [48].

## 2.2. *The Evolution of Food from an Epistemic Object to a Food Practice*

Epistemic objects, also known as “knowledge objects”, captivate our interest due to their open-ended nature and ability to transcend their physical form, fostering an “extra layer of mystery” and encouraging further exploration (p. 406) [49]. In contrast to ordinary objects that have set attributes, epistemic objects take the form of continuous processes and structures that direct our investigation, rather than enforcing inflexible research methods [50,51]. The term “question-generating” has been used to describe epistemic objects in this manner [52]. For example, making dough requires adding liquids to the flour, whether it is pure water or a vegetable juice. When a chef chooses a liquid to use in a recipe, it is not a simple decision. They also have to think about whether the flour they use will work well with that liquid [51]. The way people engage with objects in this context plays a significant role in shaping food practices, as well as other practices in general.

Practices derived from epistemic objects are inherently open-ended, and their evolution continues as long as questions about them persist [50,53,54]. As evolution unfolds, epistemic objects acquire a layered structure [55]. Ref. [52] introduces the concept of partial objects to refer to each layer in the structure. It defines them as the material representations of the epistemic object that emerge in the exploration process. This is comparable to how wheat becomes dough (i.e., practice as an entity), then dough becomes pasta or numerous pasta derivatives, like lasagna (i.e., practice as performance). Therefore, partial objects reflect the memory or open-endedness of social practices and their transformations during the epistemic exploration of foods [56]. For example, traditional meals such as “meat and three vegetables” or “rice and beans” have long served as familiar combinations that establish shared perceptions of appropriate cuisine across different geographical areas [57]. These patterns also serve as a form of practical memory of traditions [58].

Accordingly, in the context of our food research, partial objects symbolize the teleoaffective structure, encompassing a multi-layered configuration of ends, projects, and tasks, the core of a (food) practice [25]. Given that the epistemic exploration of objects typically begins with identifying ‘ends’—the epistemic goals—that guide individuals as they assign value to the exploration process [59]; for example, to create a dish for a dinner. As the second half of twentieth-century cognitive research indicates, how we explore the objects is strongly influenced by the ends we pursue [60]. In its simplest form, epistemic ends or goals can be as simple as “we must know the truth!” [61]. Ends, such as crafting a dish, play a crucial role in shaping food practices. They trigger further investigation of the food and the creation of projects and tasks, ultimately contributing to the development of the layered teleoaffective structure. In this sense, the teleoaffective structure can be conceived as a composition of partial objects originating from the epistemic object.

This exemplifies how a recipe, with its procedures and instructions developed based on the food’s nature, can be viewed as a composition of partial objects, portraying the transformation of food into a food practice. By understanding partial objects as the building

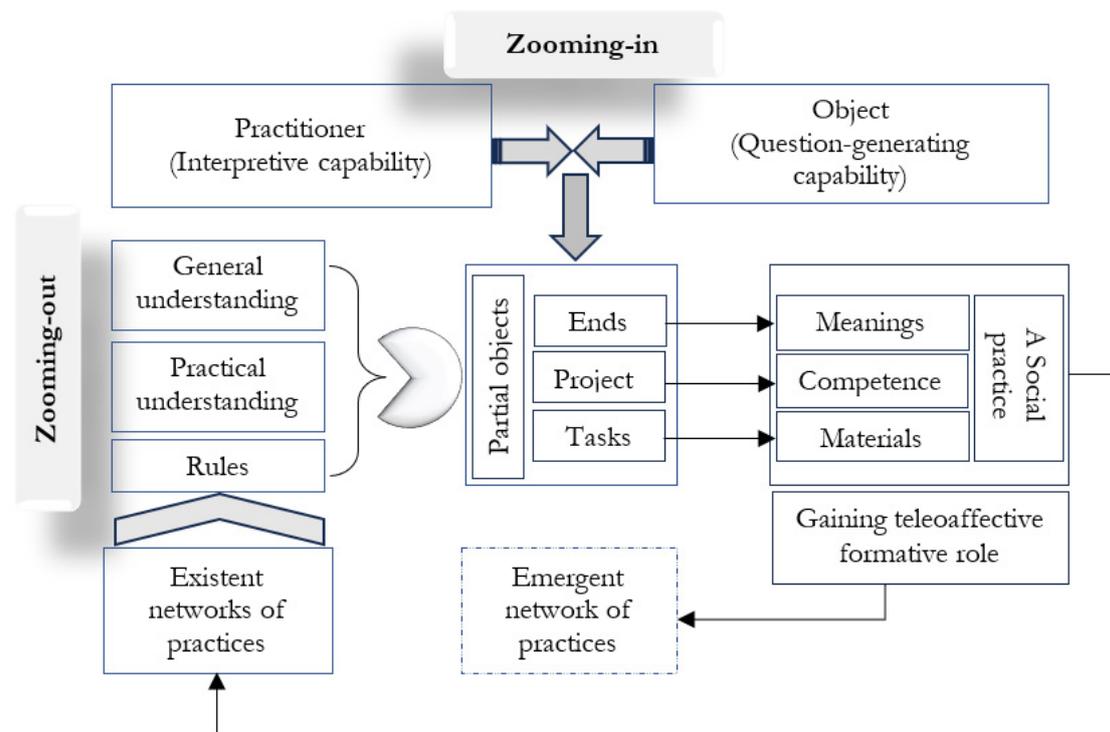
blocks of the teleoffective structure, we gain valuable insights into the evolution and transformation of food practices.

Under the light of this information, incorporating one's exploration of objects into practice analysis helps us concretely understand the layered and open-ended structure of practices and their networks, as called for by [1] and emphasized in our framework. Henceforth, a conceptual framework is provided below for the operationalization of such analysis.

### 3. Towards an Analytical Framework for Social Practice Analysis

It is advised to adopt multi-techniques when trying to understand the complex structure of social practices [21,22,62]. Deciding where to begin and the perspective to take can be challenging in this context [21,62]. We propose initiating the social practice analysis by identifying the central object (i.e., food) behind the emergence of the teleoffective structures (i.e., partial objects) of a food practice.

In our framework (Figure 1), teleoffective structures (i.e., partial objects) emerge through the dynamic interaction between practitioners and the object, facilitated by epistemic exploration. According to the framework, as long as these teleoffective structures (i.e., partial objects) connect to existing food practices and networks, they evolve into elements of social practices, as outlined by [1]. Subsequently, the explored social practice either becomes entrenched within the existing network of practices, or it gives rise to a new one, establishing its own network. As we underscore the significance of objects within the network of practices, we adhere to the definition provided by [63]. Ref. [63] conceptualizes a network of practices as "a nexus of interconnected practices, emerging from materially mediated interdependencies among communities of practice" (p. 139).



**Figure 1.** An analytical framework for the analysis of social practices and their networking.

In the following sections, we explain our framework in a step-by-step manner with two main stages, 'zooming-in' and 'zooming-out', inspired by [62], comprising five consecutive steps.

### 3.1. Zooming-In

#### *Step 1. Defining the object*

For social practice analysis in the context of food studies, as a first step, we propose to employ the fundamental rule of defining the object (i.e., food) in which the practitioner is involved as a small unit of analysis. Even in its raw form, food, as provided by geography, reflects our imaginative and explorative realities in our food-related practices [64]. For instance, we rely on specific foods to define indigenous culinary practices. The Inuit diet is characterized by sea mammals, fish, and caribou; the Truk diet revolves around starchy fruit, meat, and fish; and the Masai diet primarily consists of milk and land animals [13]. Beyond that, it is also the food, not only with its appearance but also the congruence in its shape and color, more than a gastronomic gimmick, that evokes humans' interpretation with the arousal of their five senses in harmony [65]. Hence, zooming in on how individuals engage with a food can provide valuable insights into their initial reactions, behavior, and innovative abilities [64]. A lack of knowledge of the bond between the object and the practitioner hinders the effectiveness of interventions, such as behavior-based nutrition education, that aim to change eating practices [66].

A precise identification of food is, in this manner, important for understanding its significance in the emergence of food practices and their analysis in a reliable way. For this, we propose that a retrospective tracing of the partial objects (i.e., recipes) would reveal the food behind the emergence of a dish as a practice, as ref. [21] calls for. For example, semolina and chickpeas are nowadays the most preferred foods for crafting Italian-style pasta due to their exceptional physicochemical, rheological, and sensory attributes [36], which deliver more nutrition at a lower environmental cost [67].

As the NbN cooking dishes are currently in their basic version, we illustrate our proposed framework by analyzing the foods within our sample NbN dishes.

#### *Step 2. The question-generating capability of the object*

This step requires understanding the food's question-generating capacity, including factors like color [68], texture [69], and olfaction [6], among others. In this scenario, we define capability as a food's power to inspire people to take action and encourage them to think deeply about the object using their explicit and tacit knowledge [70]. The following statement from Ref. [31] smoothly demonstrates this idea:

“Is this or that compound good for you? —is too general to serve any useful purpose. Every time you hear the phrase “good for you,” pay attention to the context in which it occurs. A fatty acid that is good for the heart may nonetheless happen to be bad for the brain”. [31] (p. 205)

This step points to how food encourages practitioners to adopt ‘ends-projects-tasks’ that they should or may pursue when becoming familiar with the food. This is where the partial objects of a potential food practice take shape. This also helps us reveal the developmental trajectory of food practices, including their variation and evolution, as emphasized in historical activity theory [48]. For example, novel materials such as legumes, rice, or cricket flour replacing semolina not only allow for the emergence of new competencies for making pasta (1.0), but also a new meaning: the production of high-quality gluten-free pasta (2.0) for sensitive and celiac consumers [36].

This step also helps us clearly see and define the open-ended nature inherent in epistemic objects [50] beyond simply as a factor creating uncertainty [51]. Especially, as in the pasta example, the capability concretely demonstrates where the open-endedness ends or why practitioners change the object in a well-known food practice. Tracing the changes in the objects, especially, can answer where the transition from practice-as-entity (pasta 1.0) to practice-as-performance (pasta 2.0) emerges. Therefore, this step is illuminative in the analysis of the transformation of food practices (e.g., 1.0, 2.0, 3.0, and so forth), especially in signifying the origin of the potential expansion or dissemination of food practices in terms of both entity and performance.

### *Step 3. The interpretive capability of the practitioners*

This step aligns with the idea of epistemic reflexivity, which aims to connect human creativity back to its origins in broader processes [56]. Rather than merely being carriers of practices [46,71], practitioners are individuals who connect with food, becoming an essential part of the diverse food practices that exist. The interpretive capability of practitioners reflects their practical knowledge and experience with other food practices. Different sources can contribute to their abilities, such as how they perceive food with all their senses [72], their cultural background [73], their beliefs and values [74], and so on. This step aims to unveil practitioners' interpretive reflections on the partial objects of a food practice. For instance, ref. [75] found that chefs' renaming "carrots" to "twisted citrus-glazed carrots" led to a 25% boost in people picking carrots with the unchanged recipe. In addition, a study [76] demonstrated that when a chef adds their signature to a dish, it encourages buying a classic meal and enhances the perceived quality of a gourmet dish.

### *Step 4. Analysis of partial objects in the emergence of practices as entities and their networking*

This step focuses on analyzing the emergent partial objects [52] resulting from the practitioner–object interactions according to Steps 2 and 3, as illustrated in Figure 1. As emphasized earlier, partial objects correspond to ref. [25]'s ends–projects–tasks trilogy of teleoaffective structures. According to this, 'ends' emerge first as long as the practitioner engages with the food, then 'projects' and 'tasks' follow with further exploration of the food. For instance, one can aim (i.e., end) to increase the consumption of yogurt in all meals of the day thanks to its value in probiotics. To this 'end', one can initiate 'projects' to rediscover yogurt's versatility as a sauce or appetizer. Then, preparing the substances to be added in a way that ensures textural harmony with yogurt, for example adding mashed garlic, and grated cucumber represent "tasks". In this manner, we can define partial objects as a recipe of a dish, and the items and instructions in it represent fundamental elements involved in the transformation of food into a practice as an entity.

Most importantly, we hypothesize that food practices converge and establish a network through the intermediary role of partial objects, because the literature shows that networks of food practices expand as long as the foods in the practices share significant similarities, associations, commonalities, or substitutability with each other [77–80]. Think about falafel, for instance. Made with chickpeas, it serves as a substitute for protein [67]. With its substitution for traditional meat patties in burgers, it has triggered a widespread vegetarian fast-food practice in many continents, thanks to the global network of fast-food practices.

In this manner, epistemic exploration of certain types of food has the potential to not only alter existing networks of practices, but also establish entirely new ones, which we indicate as "emergent network of practices" in Figure 1. Recent research presents cases that validate this statement. Ref [77] has developed a data-driven technique that enables the transfer of a region's cuisine (e.g., Japanese) to the culinary network of another region (e.g., French) through the adaptation of certain foods in recipes. Ref. [81] identified only 11 food items out of 1980 to define a community as adhering to a Mediterranean diet. Ref. [82] found that, during exploration, certain foods gain a multi-organizational form to generate a transformative impact on the current network of food practices, rather than being embedded in their dominant regimes. We can explain the function of such food items with ref. [83]'s concept of teleoaffective formations within social practice theory. A teleoaffective formation is defined as "a configuration across multiple practices, conditioned by a relational nexus of general understandings, that enjoins those practices to common ends and normatively orders the orientations and affective engagements of those practices" [31] (p. 61). For example, ref. [12] defined artful dining as a teleoaffective formation that impacts restaurant practices in general through practical and bodily-discursive configurations.

We can liken such a function of partial objects as teleoaffective formations to 'memes' that drive the emergence, dissemination, and networking of social practices. Memes, such as ideas, behaviors, habits, and language structures, represent the cultural elements that memetics conceptualizes in order to examine the evolutionary trajectory of social practices [84]. Ref. [84] expresses the term "meme" as a carrier of knowledge and practices

in cultural evolution, similar to genes in biological evolution. For example, the viral spread of Basque-style cheesecake around the world refers to the memetic process, and cheesecake refers to a cultural meme.

Taking into account this information, this step emphasizes the significance of partial objects in facilitating the nourishment of elements that contribute to the formation of social practices within the established network of practices. Hence, partial objects act as catalysts, influencing the elements of materials, competences, and meanings that make up food-related social practices defined by [1]. For example, people in Asian countries mostly consume dried vegetables directly as chips, emphasizing a material-driven practice. Individuals in Anatolia transform dried vegetables into flour and dilute them with yogurt to create a soup called Tarhana, showcasing a competence-driven practice. The discovery that this soup effectively relieves colds during winter months can lead to the emergence of a meaning-driven practice worldwide.

### 3.2. Zooming Out

#### *Step 5. From partial objects to elements of social practice*

We modify the concept of “zooming out” [62] with a focus on how the partial objects gain meanings in time and space in wider communities of practices and are transformed into elements of social practices [21,55,85]. In this context, as shown by the partial circle in Figure 1, this step shows how partial objects can adapt to or fit into the existing elements of food practices within different networks of practices. Thus, this step illustrates the points at which partial objects acquire shared interpretations [57] and, subsequently, accumulate performative memory [58], gaining social recognition and thus become elements of social practices as defined by [1].

This is particularly evident when partial objects connect with the common or shared ‘ends’ within teleoaffactive formations [83] in a network of food practices in a community. As mentioned before, networks of food practices expand when the foods within these practices possess significant similarities, connections, commonalities, or interchangeability with one another [77–80]. Yogurt, for example, has turned into a global practice that accompanies many food practices, thanks to its simple and cost-effective way of improving the nutritional value of dietary practices [86]. Therefore, this step clarifies how teleoaffactive structures (i.e., partial objects for this study), as defined by [25], become elements of social practices identified by [1]. This approach thus also helps to reduce complexity in analyzing social practices by connecting and building upon the work of both researchers, offering a comprehensive framework for the analysis of practices from their infancy onward.

Focusing on the transition of partial objects to elements of social practices enables us to analyze or trace the evidential trajectory of the ‘emergent network’ of food practices rather than in a predefined manner, evoking an evidence-based practice understanding. Namely, within the field of medicine, evidence-based practice studies aim to trace the evolutionary progression of objects, specifically disease-causing microbes. This provides a rational foundation for a comprehensive network of effective diagnostic and treatment practices, which can be performed and shared widely [87]. Thus, our evidential approach, called for by the claims of [1,88], also helps practitioners trace the sources of ‘consciousness and intentionality’ in the dissemination of food practices in a network or create a new network, named ‘emergent network of practices’, as shown in Figure 1.

## 4. Methodology

To exemplify the proposed framework, we focused on NbN cooking. Our framework places significant emphasis on the exploration of food as epistemic objects, making NbN cooking an exemplary case that reflects this approach. For this, we analyzed Hervé This’ book titled *Note-by-Note Cooking: The Future of Food*. The book is the first and only comprehensive source of NbN cooking. Hervé This stresses the importance of viewing food as epistemic objects in his philosophy on food. He says “the enlightened cook will begin by

reasoning from simple physiochemical facts (p. 192") [31]. The following paragraph is very reflexive in his view:

"With note-by-note cooking; shapes, consistencies, tastes, odors, trigeminal sensations, and colors can now be created independently of one another, or very nearly so. The main problem facing us at this point is that there are too many possibilities! The chef is seated before his piano. What kind of culinary music will he decide to play?". [31] (p. 185)

In this paragraph, it is evident how food, regarded as epistemic objects, concurrently constrains and enhances the evolution of dishes as practices situated at the nexus of practitioner–object interaction in an open-ended way. The primary aim of this analysis is to illustrate the analytical framework rather than to conduct a thorough examination of NbN cooking.

#### 4.1. Data

For the zooming-in, we analyzed the recipes (pp. 227–236) in ref. [31]. Due to their dual symbolic and literal nature, recipes are the finest approach to illustrating how a culture functions [89], and are at the heart of routine explorations of the natural world [16]. Moreover, recipes are appropriate unit of analysis, since social practice theory focuses on the analysis of social practices, considered as a nexus of 'doings' and 'sayings' fastened by teleoaffective structures, practical understandings, general understandings and rules [25,46], with an emphasize on habits and routines [90]. We conducted an analysis of the remainder of the book, focusing on the process of zooming out, with an aim to explore the development of NbN cooking within the broader social context. In practice theory, all these qualitative data categories may be evaluated as practitioners' performances [22].

#### 4.2. Analysis Methods

The data were analyzed by qualitative inductive and deductive content analysis within the predetermined interpretative schemes (i.e., the elements in the proposed analytical framework), where the data were coded and classified into thematic categories (indicatively, refs. [23,91]). The goal of employing content analysis was to illustrate how the proposed framework describes the phenomena conceptually [92]. We used an inductive approach during the zooming-in and a deductive approach during the zooming-out to deal with the fragmented structure of the practice theory [92].

## 5. Findings and Discussions

### 5.1. Application of Zooming-In

In NbN cooking, food and practitioner interact at the "ends" of how we can generate a creative dish from the nutritional components of food.

As exemplified along with the phrases in the following, and summarized in Table 1, the exploration of food revolves around compounds and their coloring effects, processability, versatility, interactional power, time requirements, and materials for extraction. These provide unlimited variations of a dish as long as the practitioner develops an interpretive capability in terms of chemical knowledge, invention capability, imagination and practical knowledge summarized in Table 1. The following phrase concludes this case as:

*"In cooking, as in music, the arrangement of well-chosen sensory units allows us unlimited freedom: we can produce any sound, any music or any flavor, any food". [31] (p. 23)*

**Table 1.** Analysis results during zooming-in process.

Zooming-In		
Interpretive capability of the subject	Question-generating capability of the object	
Chemical knowledge	Color	
Invention ability	Processability	
Imagination	Versatility of compounds	
Practical knowledge	Substitutability (fabrication vs. extraction)	
	Interactional power	
	Time requirement	
	Material requirements	
From partial objects to elements of practices		
Meanings	Competences	Materials
Recipe's birth of place and time and short story	Unique preparation techniques	Acute definition of supporting ingredients
Testing and gradual modification	Unique proportioning(s) in recipe	Substances rather than ingredients
An exact step-by-step assembly of compounds	Fabrication of materials	Imaginary namings for dishes
	Compound knowledge	Certain measures
	Predisposition to composition	Presence of suppliers

The acknowledgment of a mindful exploration of food empowers NbN cooks to flexibly explore and execute projects, thereby preparing the ground for the growth of competence-driven culinary practices. In particular, projects were provocative in the emergence of materials and meanings, as shown in Table 1. For example, unique preparation techniques (i.e., projects) pave the way for imaginative dish naming based on materials, testing, and gradual modification of meanings. The unrestricted use of various measures (i.e., tasks), such as adding a single drop of a substance, fosters the creation of diverse flavors and gives rise to new names for the emerging dish, as in the following phrases:

*"The development of molecular cooking was accelerated by the publication of recipes that chefs then tested and gradually modified. Here, then, without any further delay, another small step along a road with no end!"*. [31] (p. 227)

*"Last, but hardly least, there is the question of what we are to call note-by-note dishes once we have created them. In April 2009, Pierre Gagnaire named the first dish in the history of note-by-note cooking "Note-by-Note No. 1." One could carry on in this vein (No. 2, No. 3, No. 4, and so on)"*. [31] (p. 193)

Another example involves the need for diligent projects in recipe production, which demands a commitment to precise measurements in terms of ingredients. This precision imbues the recipe with a sense of origin, timing, and a meaningful narrative, as in the following phrases:

*"Dead Leaf (to 600 mL water add 400 mL ethanol, then 0.0001 g calcium phosphate, 0.001 g sodium phosphate, 0.3 g oenological tannins, 10 g glucose, and a drop of a dilute solution of paraethylphenol (about four parts per million) to give a peat taste"*. [31] (p. 229)

*"Note-by-Note Beet Soufflé, prepared by the members of the Paris chapter of Les Toques blanches internationales as part of the chapter's 3 December 2011, televised charity event"*. [31] (p. 231)

Based on the examples, projects are what positions NbN cooking as a candidate to accelerate its transformation into a wider socio-technical competence-driven food practices.

## 5.2. Application of Zooming-Out

The findings of this step aim to illustrate how NbN dishes, by incorporating elements from the available network of practices, foster a sense of collective memory among practitioners or gain normativity (in terms of acceptability or oughtness), resulting in their transition into a social practice. Explained along with the phrases in the following, Table 2 summarizes that NbN cooking gains normativity mostly through societal acceptability.

**Table 2.** Analysis results during zooming-out process.

Zooming-Out	
NbN cooking's connection to elements of existent food-related networks of practices	
General understanding	Modern discourse Beyond space and season Similar origin of inspiration in traditional culinary Postmodernism Sustainability Obesity pandemic A voice in building today's culture
Practical understanding	Transference of techniques from the chemistry Use of compounds in our daily life (lactose-free milk, butter etc.) Practical guidance Energy crises Ergonomic value
Rules	Referencing Scientific rules Regulatory agencies Legal framework

Specifically, in terms of general understandings as shown in Table 2 and exemplified by the following sample phrase, NbN cooking welcomes being recognized as 'a modern discourse' of tradition because breaking with tradition will not easily be well received:

*"Painters, using modern pigments, can perfectly well make traditional figurative works, but they can also make works so strange that viewers who have not made the effort to learn a new pictorial language cannot help but angrily denounce them. "That's not art!" they cry". [31] (p. 186)*

In another instance, its acceptability is underlined by promoting it as a practice that is beyond space or season:

*"No compound known to chemistry is uniquely associated with a particular place. No compound has a particular season". [31] (p. 186)*

In terms of oughtness, NbN cooking is promoted as a solution for sustainability and obesity issues. For example:

*"At the same time, we are witnessing the early stages of an obesity pandemic because our bodies were not designed to cope with the abundance of foods presently available to us and because older styles of cooking, which developed in a world of far more limited resources than today, are no longer appropriate to the situation in which we find ourselves". [31] (p. 202)*

In terms of practical understanding, as demonstrated in Table 2, it is noted that people's current practical understandings of energy crises and ergonomics already provide a foundation that facilitates the acceptability of NbN cooking. For example:

*"Mountains of veal bones are still boiled every day to make stocks and demi-glaces and the like. Sooner or later the increasing cost of energy is bound to make such practices look like a pointless extravagance". [31] (p. 223)*

*“Why use ten eggs to make meringues for ten people when a single egg is enough to make quarts of the stuff?”*. [31] (p. 224)

Similarly, in the related literature, nutrition and sustainability are accepted as determinant factors for the development of NbN dishes and drinks [93].

It is also understood that NbN cooking needs to develop its own practical guidance, primarily based on macro-environmental conditions such as energy crises and ergonomic value, as emphasized by the following phrase:

*“The note-by-note cook must have ingredients. Which ones should he use? How can he get hold of them? Even more than accurate information, what cooks tempted to experiment with note-by-note cooking need is practical guidance”*. [31] (p. 210)

In terms of rules, as summarized in Table 2, we can see that NbN cooking requires well-established rules for both its technical foundation and for the larger environmental conditions that are scientifically regulated by authorities and protected by legal frameworks. As can be seen in the following excerpts, regulatory bodies and the legal system serve as examples:

*“Cooks are therefore well advised to take the warnings in the EFSA (European Food Safety Authority) compendium seriously and to avoid taking undue liberties (p. 209).”*

*“If note-by-note cooks are honest and show proof of due diligence in vetting new techniques and preparations, they should not worry about having to spend time in court that would better be spent in the kitchen”*. [31] (p. 222)

Overall, NbN cooking represents a paradigm shift within culinary arts by emphasizing the manipulation of ingredients at the molecular level. This novel methodology transcends mere gustatory satisfaction, demonstrably contributing to solutions for contemporary challenges in sustainability and public health. As such, NbN cooking emerges as a significant advancement in the field of gastronomy.

With global food systems facing increasing strain due to population growth, climate change, and resource depletion, NbN cooking offers a promising solution. By optimizing ingredient utilization and reducing waste, it promotes sustainability. Moreover, NbN cooking has the potential to reshape our understanding of nutrition and gastronomy, challenging traditional notions of flavor and texture. Through meticulous experimentation and precise manipulation of ingredients, it provides a new way of exploring food that facilitates the creation of dishes catering to diverse dietary needs and preferences. This ultimately promotes inclusivity and culinary creativity.

However, the integration of NbN cooking into the broader food networks requires more than just technical innovation. It necessitates a shift in consumer attitudes and industry practices, as well as the development of robust regulatory frameworks to ensure safety and quality standards. Additionally, education and outreach efforts are essential to familiarize chefs and consumers alike with NbN cooking techniques and principles, fostering greater appreciation and adoption of this groundbreaking approach.

In essence, NbN cooking represents not only a culinary revolution, but also a catalyst for broader societal change. By harnessing the power of science and creativity, NbN cooking has the potential to transform how we produce, consume, and perceive food, ultimately paving the way towards a more sustainable, equitable, and delicious future. Therefore, instead of integrating with existing food networks, NbN cooking may require establishing its own distinct network of practices. This is also indicative of why we need to consider object-practitioner interaction to define and analyze networks of practices, as proposed in the introduced framework.

## 6. Conclusions

This study aims to introduce a qualitative framework that offers a step-by-step understanding and analysis of the origins and connections between social practices. By adopting ref. [62]’s zooming in and zooming out approach, the framework presents an

alternative to the quantitative model proposed by [94]. Bridging the gap between the two most widely employed models in social practice analysis, refs. [1,25], our framework stands as a pioneering effort. It presents these models in a complementary manner, operationalized in a multitude of concepts (i.e., evidence-based practice, memetics, epistemic objects, teleoaffective formations), thereby offering an interpretive approach to social practice analysis.

To provide an empirical illustration, we used NbN cooking. Beginning with the zooming-in step, we exemplified that the emergence of individual food practices in connection with other food-related practices does not imply that these practices become mere components assimilated into the dominant regimes of the networks to which they are related. Rather, (a) practices can gain mobility among different networks of practices, similar to a memetic process, or (b) they can transform into teleoaffective formations that can gather practices under their own network. We concluded that both of these scenarios were possible as long as the object under epistemic exploration gains a multi-organizational form among communities of practice, as suggested by [82]. For example, NbN cooking can evolve into a dieting practice within the network of anti-dieting practices for obesity, or serve as an umbrella or a grand network under which other networks of practices (for example, related to sustainability) gather. In contributing to theoretical development, we can define three points:

(i) Retrospective analyses of the evolution and transience of practices. The framework can enable one to trace the historical intelligible patterns or how the practice had its memory, as studies [57,82] call for and which the recent studies still fail to consider (indicatively, refs. [12,21–24]). This is crucial to address the challenge of defining practices as distinct units of analysis, especially considering their emergence as material representations of other practices [52]. Analyzing the entire trajectory of a single practice in relation to other practices (becoming social) would also allow us to understand the semantic cohesion within the network of practices, as proposed by [1] and called for by [66]. For instance, one may better understand transitional cuisines such as Tex-Mex or fusion cuisine in general, as advocated by [45]. For example, it was the competence (i.e., the artistry expertise of the chefs) behind Chinese cuisine's transition into the menus of high-end restaurants in China [41]. In another example, as explained by [73], the informality of homey cuisine in the USA led to a transformation in gourmet restaurant style, where haute cuisine merged with the comfort of home-cooked dishes.

(ii) Introspective analyses of the intended transformations of practices. With the growing demand for sustainable food systems, and the popularity of green gastronomy and healthy eating, culinary practices must transform to promote planetary health diets. The framework can facilitate a simulation study aimed at developing objects with a teleoaffective formative role, thus transforming unsustainable food networks. Alternatively, objects fulfilling this role within the networks can be reconfigured to promote sustainability. For instance, ref. [14] discovered that in a waste management project in Finland, only hanging a red flag outside school restaurants to indicate that food remained after students' lunchtime has established a practice that outlines the course of the day for retired and unemployed people. According to [26], plant-based meat served as catalysts in shaping consumers' daily food practices, from preparing food to eating out. Along with such evidence, our framework thus operationalizes ref. [21]'s claim that using certain objects may enable determining how practice transformation can be proactively facilitated.

(iii) Analyzing networks of practices based on their emergence, rather than in a predetermined way. Analyzing networks of practices as 'emergent', as outlined in our analytical framework, rather than using predetermined frames such as general eating practices [21], vegan eating practices [45], and production networks [95], would: (a) enable us to define existing networks more clearly and uncover networks under the surface; and (b) allow us to outline the differences among various networks of practices based on their formation, categorizing them into meaning-driven, competence-driven, and material-driven. For example, it was shared dining practices that contributed to Guangdong cuisine's

popularity in Hong Kong, along with the Hongkongers' starving for more rich dining expectations and healthier and more mindful cuisine [96]. In another example, it was cultural differences (meaning), ingredients (materials), and talent (competence) behind the transference of Michelin-star Japanese restaurants' cuisines from Japan to Hong Kong while preserving their identity and originality [41].

In terms of these points, we can define the practical contribution of this study within three points. Firstly, in order to detoxify undesirable practices, such as unsustainable ones, practitioners can use our framework to understand how practices are ideologically coded around specific objects within certain communities of practices. For example, altering the textural parameters of certain foods (e.g., developing harder, chunkier, more viscous, voluminous, and/or solid food or beverage products) increases satiation without compromising acceptability, thereby reducing overconsumption [97]. Secondly, practitioners can strategically introduce certain objects into the network of practices, depending on their resources and available skills, to neutralize undesirable ones. Yogurt, for example, minimizing cognitive effort and offering a low-cost advantage, has significant potential to change the food landscape within the culinary habits of many societies [86,98]. Therefore, thirdly, practitioners can use our framework to develop or encode alternative practices to counteract existing ones, or to expand the new ones such as NbN cooking. The application of this framework to diverse empirical analyses will reveal that its potential and efficacy are not limited to the domain of food.

As one constraint of this study, we recognize the need for additional empirical analysis to validate our proposed framework's potential benefits and necessary adaptations. Moreover, the multi-step framework may be adopted based on the pertinent research problem and the object chosen. Steps in the framework may need extensions to be adaptable for the analysis of network of practices based on the research question and different units of analysis (i.e., objects).

Through the introduction of this framework, our aim is to stimulate a more systematic and in-depth analysis of social practices and their networking, emphasizing their emergence. We contend that our framework extends beyond food-related practices, finding application in the analysis of various domains such as energy and sustainability. Drawing further conclusions and development opportunities will necessitate the application of this framework in diverse empirical research contexts. We encourage future researchers to apply our framework (e.g., in an observational study) in a setting where individuals' interactions with an unfamiliar object elicit the elements of practices in different communities, geographies, occasions, etc. We also advocate for future studies to analyze how the manipulation of objects with teleoaffective formative roles within a specific network of practices can contribute to the development of more sustainable practices.

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