

Evolving Creativity

An Analysis of the Creative Method in elBulli Restaurant

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Abstract— In this article we present an analysis of the creative method developed in the restaurant elBulli (www.elbulli.com) over the period 1987-2005. elBulli has been the 5-time recipient of the Best Restaurant in the World by Restaurant Magazine, and media, professionals and scientists have recognized the global impact of its work in the food industry over the last two decades. This impact is closely connected to the model of evolving creativity that elBulli team has implemented and refined over the years. We combine the qualitative study of documents produced by elBulli restaurant with networks analysis in order to represent a model of evolving creativity that can be applied to other domains and industries.

Keywords -- Creativity; Network Analysis; Innovation; Gastronomy; Complexity

I. INTRODUCTION

In June 2007, Ferran Adrià, the renowned Spanish cook and co-owner of the restaurant elBulli (for a detailed account of Adrià's story at elBulli restaurant and the working method they have implemented over the years, see [1] and [8]) attended as a special guest the inauguration of Documenta 12, the famous art exhibition that takes place yearly in Kassel, Germany. In that event, Roger Buergel, the director of Documenta 12, announced that the restaurant located at Cala Montjoi, Spain, would become the Pavilion G of the exhibition and that for each of the 100 days of the exhibition, the restaurant would host two people who would experience having dinner there. Also, Buergel called the attention of media and art experts about the debate on artistic disciplines that cannot happen inside a museum. Media uproar immediately followed the announcement, and yet another debate about the borders of art and creativity, on the one hand, and about the alleged confines of cooking to mere craftsmanship, on the other, started around the famous chef. Some critics were fast to point out their fingers at the Documenta director, accusing him of concocting a media coup only directed to raise the profile of the event. Others complemented the argument by accusing both Buergel and Adrià of trivializing art, and of trying to elevate cooking to a rank it did not belong to, that of artistic creation. The debate is interesting because it underlies the social ambiguities around creativity at the beginning of the 21st Century as well as the barriers for chefs to be considered creative artists. It also raises the questions of where creativity comes from and whether creative processes that have emerged in a

particular domain can be successfully transferred beyond its original sphere.

In this work we apply semantic network analysis to the study of how the information is organized in the two layers of elBulli team: the schema layer where the abstract concepts relate each other as pieces of a puzzle, and the recipes level, where all the ingredients and techniques combine to provide an actual product, and we conclude how this methodology could be applied to knowledge discovery in complex environments.

II. METHODOLOGY

We can observe the levels of complexity of elBulli's creative method through different angles. The first one is the conceptual map that supports the team's processes of self-study and knowledge management.

In order to represent this, we have extracted the information contained in the catalogues published by elBulli ([2][3][4]) and transformed it into a single data schema that help us to categorize, store and analyze all the data. From this first process slightly different data schemas emerge, corresponding respectively with three phases of evolution in the restaurant's creative method, but the main structure to capture the data collected over the 1987-2005 period stays basically the same (Fig. 1). We can find two main hubs: on the *recipes* side we have *temperature*, *year* and recipe-level nodes such as *style* and *styles family*, *recipes family*, *technique* and *techniques family*; on the *preparations* side of the network (a preparation is the result of applying one or various techniques to one or various products in order to obtain a conceptually finished result), we find: *preparation family* (fundamental to categorize evolution over time), *preparation technique*, *world* (sweet and savoury), *ingredient*, *flavours* and *products* (the result of applying *techniques* to one or more *ingredients* to elicit certain sensorial effects, mainly *flavours*, but also *smells*, *textures* and *temperatures*), that paint a distinctive preparation landscape that complements the work around recipes.

We have projected this information into a database keeping the types of elements and relations contained in the original data, but our data model is not defined over a standard relational table schema, but over a *Multi-Relational Graph Database*, a data graph structure where the units of information, the nodes of the graph, can be simultaneously related by several relation types (in the previous schema, the several relation types are not shown; for example we can

relate the same *product* with a *preparation* by using it as *filling*, *base*, *finished product*, etc.). As in *Relational Databases* there exists a standard query system (SQL) to extract knowledge from data, in *Graph Databases (GDB)* query systems based on *traversals* are becoming the standard.

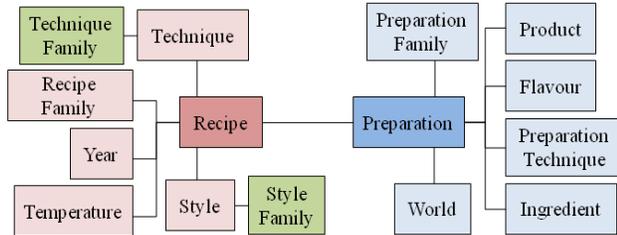


Fig. 1. Simplified scheme of the graph DB used in this work.

Traversing a graph means visiting its nodes following a path, using the relationships according to some rules. In consequence, a *traversal* can be uniquely described by two data items: a *start node*, and a *specification rule* for the schema of the path that will be used for traversing the graph. The result leads to a set of nodes connected by paths. Depending on the structure of the graph and the traversal itself for every starting node the resulting set may contain zero, one or many nodes (even repeated ones, indicating that more than one path, which meets the definition of the traversal, connecting the two nodes have been found). In order to use traversals as a query system we can interpret them as graph transformations in the following way:

For a given multi-relational graph, G , and a traversal $T = \langle N_1, e_1, \dots, e_{n-1}, N_n \rangle$ in its schema (N_i are types of nodes and e_i are types of relations), the application of T over G is a new graph with nodes in $N_1 \cup N_n$ and with weighted edges where for every pair $(n_1, n_2) \in N_1 \times N_n$ the weight of the edge from n_1 to n_2 is the multiplicity of the node n_2 in the application of the traversal T starting on n_1 (0 means that there is no path connecting them and we remove the edge).

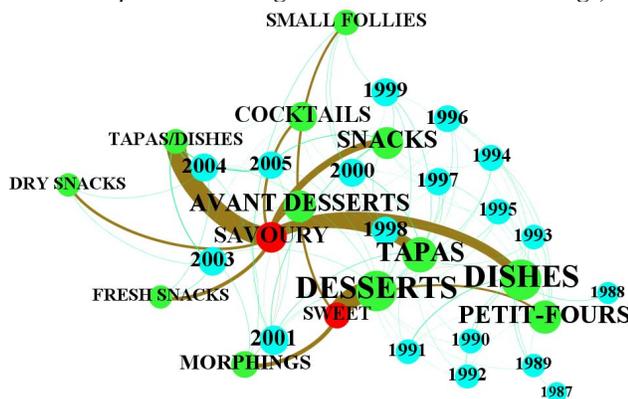


Fig. 2. Relations between worlds, recipe families and years (traversals: *Family Recipe* to *Year*, *Family Recipe* to *World*, and *World* to *Year*).

If in the previous scheme we traverse from *World* (savoury or sweet) to *Family Recipe* (passing through *Preparations* and *Recipes*), we will find the connections between the use of a specific world to every type of recipes

according to its family. We can combine different traversals at the same time to extract more complete knowledge from the graph (Fig. 2).

All the results and conclusions we show here are obtained from different traversal queries applied on the GDB built from elBulli information.

III. EVOLVING CREATIVITY IN THREE PHASES

Research on creativity has underlined the fact that having a problem to solve is essential for the creativity process so that the problem gets considered and redefined as the result of a continuous process [6][12]. The initial problem for elBulli was to be able to innovate in high-end cuisine, and they redefined the problem until it got transformed into how to make creativity the cornerstone of their practice and, finally, how to make creativity sustainable and evolving in the long run.

The decision to be creative and to make creativity the core of Adrià's activity is consistent with the investment theory of creativity that sees creativity as a decision and therefore, as something that can be developed [13][15]. This decision to become creative led to the processes of self-study and knowledge management that the team started in 2002 and became since then a normal part of the restaurant's workflow. Also, this decision about focusing on creativity pushed the team to develop a codified culinary language in elBulli in 2002 that would guide the creative method of the organization from that moment onward, and was the first step to the categorization and relational process we use in this work. This method can be traced back through three different phases that emerge as a result of several of the analysis that we describe below: 1987-97 (consolidation and mastering of the main techniques of high cuisine), 1998-2001 (exploration of their own path and creation of a new language), 2002-05 (explosion of creativity and systematizing of a method to make creativity evolve and sustainable). In the different clusters we obtained from our traversal queries, we could also find these three phases clearly separated.

The grammar of elBulli's new cooking language is organized around a few building conceptual blocks whose own independent evolution along with combinations with other building blocks. The use of "technology" includes the normal use of traditional kitchen utensils as well as the invention of gadgets and machines needed to carry out some of the more complex preparations. Technology has been a pillar of the method as it has always played the role of a bridge between the new "concepts" the team wanted to implement and the techniques necessary to make those concepts into preparations. The invention of new preparations implies a deviation from a traditionally recipe-oriented cuisine towards a lower level and more productive focus in the cooking and creative process, as we can see from the data schema. Sometimes these preparations have a long tradition in cuisine, whereas in other cases they have marked the most spectacular aspects of elBulli cuisine, such as the *foams*, the *airs*, and the *spherifications*. It is important to note that the method distinguishes between intermediary and final preparations in a two-step classification that indicates

the ability of preparations to become part of more complex or final preparations. This introduces a level of transformative power into the sustainable dimension of a method of creativity that constantly evolves and that can be observed in our GDB as a multilayer hierarchical structure. The ability to consider a preparation as a product in use for other preparations provides a powerful grammar syntax that gets reflected in the very complex traversals that can be defined.

The final goal for elBulli team is the creation of new and surprising experiences, not the production of new recipes. It is the dish —understood as the culinary trigger of a holistic experience that uses technology to elicit emotional responses from the patron— that matters, not the recipe as a set of instructions. This is why in elBulli the process of creation has moved from the traditionally oriented cooking methods in which the pair dish-recipe formed the cornerstone of cuisine. Building on, but also separating from, the advances of nouvelle cuisine, what elBulli team has done since the 1900s is to re-think cooking and creativity in order to design a method that, through the creation of a more complex and nuanced ontology of cooking, would multiply the creative effects of all elements involved in the schema —*ingredients, products, techniques, preparations,...*— thanks to the diversity of connections established with other elements of the same schema. If the purpose of a good recipe that becomes successful is to be copied as a meme by professional and amateur cooks until it becomes a staple in the cuisine landscape, the objective of elBulli's creative method is to multiply the possibilities of creating multiple dishes through the very method of creation. In this regard, creating a new recipe gives just one dish, but creating a new technique, or a new concept, or a new preparation opens up the possibilities for the creation of numerous preparations (families) and, therefore, multiple new dishes. In addition, when there is enough feedback in the system so that elements such as applied techniques can in some cases become preparations, or certain preparations become part of more complex preparations, then the expansive properties of this method are noticeable. This is why elBulli catalogue for the period 1987-2005 included a total of 1214 *recipes* or dishes (in the book *Food for Thought*. *Thought for Food*, the editors recorded 1461 dishes until 2007), out of 4636 *preparations*, 900 *styles*, 139 *techniques*, 12 *recipes families*, 202 *preparations families*, 22 *styles families*, 7 *technique families*, 1732 *ingredients*, 201 *products*, 27 *temperatures* and 628 *flavours*. All these feedback loops and connections around the two main hubs and the smaller nodes have proven extremely fruitful in the final objective of developing a system of sustainable and evolving creativity.

The effects of elBulli's creative method are easily reflected in the changes underwent by the structure of the menu over the years. One of the analyses of the graph (Fig.2) shows this evolution as nodes of consecutive years cluster around the specific phase they belong to. The convenience of this clustering of nodes comes from the fact that not only the same discrete phases they emphasize are shown, but also the similarities between different years in these phases.

In terms of the number of preparations, the *savoury* world takes over most of the preparations across years (Fig.3). Only 1996 and 1997 show different results. We can see the increase in the total number of dishes produced from the first few years, with an average of 25 dishes, to the 120 dishes a year that the team created more recently, where the gap between the dishes in each world grows considerably.

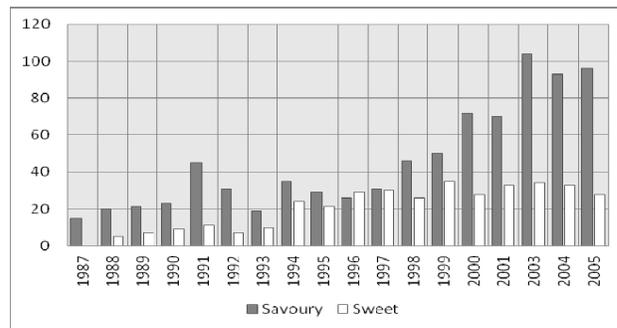


Fig. 3. Comparison of number of recipes for each world by year.

We have also analyzed how temperature affects the organization of the creative method over the years. There are 28 different temperature categories to classify dishes, of which *room*, *hot* and *cold* are the main and most important. In Fig.4 we show the result from a traversal that links years and these main temperatures according to the volume of recipes that use that specific temperature in a certain year.

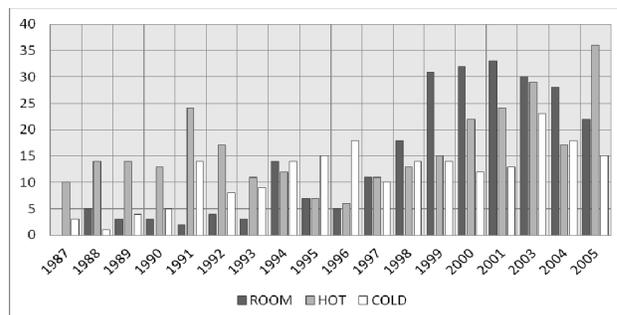


Fig. 4. Use of temperatures in recipes across years.

Over the years there is a considerable increase in the number of recipes that are served at *room* temperature from 1998 onwards. It seems as though the most traditional structure of the menu in high cuisine would imply a use of hot dishes for the main-dishes category, whereas the progressive differentiation of recipe family and, therefore, of culinary experiences offered by the new method, implies a nuanced version of the temperatures associated with the new dishes.

The combination of flavours and products in dishes has been a constant concern in the classifications carried out by the team at elBulli at least since 1991, although there are already traces of it in the 1987 catalogue. Actually, elBulli identifies as flavour each of the products that are combined in a dish. There are a great number of flavours that are exclusive of specific years. If we consider only those

flavours that are not use in common for all years simultaneously and do a clustering of the years according to a force layout we obtain Fig.5, where distances between years reflect similarities on the use of flavours. This has to do with the team’s decision to avoid repeating themselves and keeping always the doors open to novelty. Again, it is the most recent years that show a highest degree of experimentation as they use more flavours not used previously.

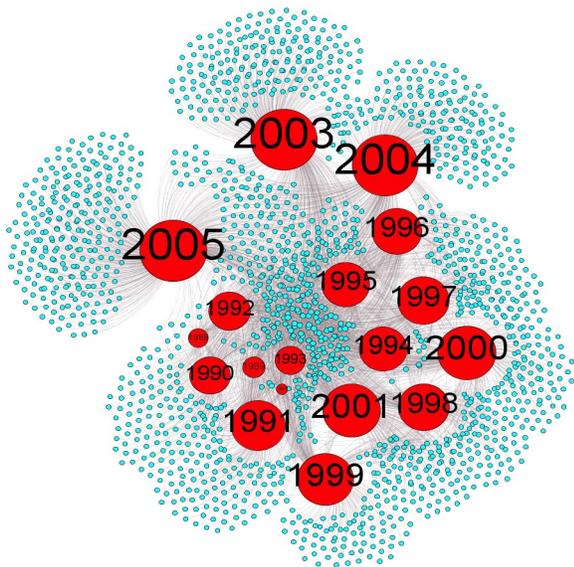


Fig. 5. Exclusive flavours used by different years. A force layout has been applied to emphasize the clusters. Size of nodes are related to number of non common flavours in use.

In contrast, we have an important set of flavours that are common to several years (Fig.6). Again, after a force layout that approximate clusters we clearly see a clustering around the years and periods that define the three phases of evolution of the creative method. As the graph shows, it is within the same phase that repeated flavours are used again the most, reflecting a research method that exhausts a certain problem before moving into another line of research (a new phase). Curiously, almost all of the most used flavours over the year (lemon, chocolate, lime, yogurt, coffee, orange, coconut, etc.) are used in preparations belonging to sweet dishes, even though the savoury world is overall larger than the sweet world. This indicates that the savoury world enjoys a much more diversified set of elements and that the sweet world relies on a stable core that allows for less type variation. Also, the relative position of years is similar in both layouts, showing that the phases considered in elBulli evolution are robust across different classifications.

IV. “CREATION IS NOT TO COPY”: AN EXPLOSION OF CREATIVITY

Following [7] and [11] (pp. 366-367), in “the French culinary tradition, creativity is the refinement of classical or traditional culinary arts, and top chefs do need to know the classical arts to refine them.” It is commonly accepted that traditional cuisine is based on a given set of recognizable

dishes in different regions and traditions, a method of transmission based on the recipe, and a concept of high cuisine revolving around a few special products, a specific menu structure, and certain techniques very much connected for the last few decades with the spread of nouvelle cuisine. This statement reflects well the first phase of elBulli, until the year 2002, in which the team carried out a deep process of self-examination to establish a method of evolving and sustainable creativity, when the focus shifted from recognizable dishes belonging to a recognizable tradition towards a set of advanced techniques, allowing elBulli team to pay attention to all aspects of the culinary process, but especially to the set of techniques that differentiated traditional cuisine from haut-cuisine. Adrià and the team at elBulli embody the change that the world of cuisine is undergoing due to the global competition in the culinary industry and the need that chefs have to create new dishes and culinary products as competitive advantages. For Horng and Lin [10] “chefs are no longer skilled workers; they have become inventors or creative artists who are able to create delightful and surprising dining experiences for the restaurants’ customers.”

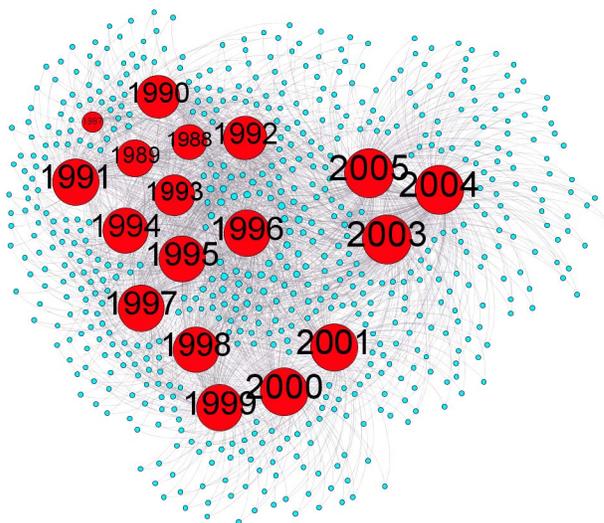


Fig. 6. Flavours in common used by different years (obtained from traversals linking *Flavour*, in red, to *Year*, in blue). Size of nodes are related to number of common flavours in use.

The original turning point in Adrià’s thinking about cooking is well documented. In 1987 he visited the south of France and had the opportunity to attend a seminar by French chef Jacques Maximin; in the discussion that followed the presentation someone asked Maximin what creativity was for him, and he answered: “creativity is not to copy”. If up to this moment elBulli had focused in serving high-scale food with some locally influenced plates based on variations from the nouvelle cuisine movement, from that moment on finding its own way and identity would become the main purpose of elBulli. This meant a separation from the conception of creativity as the refinement of classical culinary arts that was key to French cuisine [7][11].

According to their own philosophy, the initial objective of this first phase was to differentiate themselves, but soon developed into a more complex process in which creativity would become the cornerstone of elBulli; in a third moment, the challenge was how to sustain the level of creativity that came to be synonymous with Adrià and his restaurant.

In the process of establishing a method of creative cuisine Adrià and his team rethought the importance of products and moved away from the previous set of special and expensive products typical of high cuisine to all those which are essential for the conceptual directions of the creative project at any given moment regardless of their market price. This implied a widening of the range of products and an opening of their menu to techniques, products and influences from distant geographic areas.

This led to a very important conclusion that helped to organize the method for a creative cuisine from that moment on. A recipe is a sort of algorithm that explicitly gives a set of instructions to reproduce a given dish: they are excellent for reproducing existing culinary knowledge. But if reproduction is not the objective any more, then the recipe would be just a by-product of the whole method, not the cornerstone. For the new method of creative cuisine creativity was to be anchored at the levels of preparations, techniques and concepts, as it is at these levels that creativity in the kitchen may become evolving creativity. What Adrià and his team did was to develop and implement a method to achieve what Horn and Lin [10] have described as the objective of a truly creative form of culinary art, that is, a “wider variety of dishes, as well as more innovative, aesthetically, and culturally innovative individual dishes”. The development of new techniques, the inclusion of new concepts, the constant addition of new products and, specifically, the combination, mix and merger of all elements would open the floodgates of discovery into the creation of new preparations and, along with it, a considerable increase in the rate of innovation. This increase can be seen in the growth in the numbers of hubs and relations in their method (data schema) that would result in a multiplication of the dishes and recipes produced at the end of any given season.

There were two other decisions that would mean a leap forward in the development of the new method. The first was organizational and has to do with the closing of the restaurant six months a year and the simultaneous creation of a cooking research lab —called *el Taller*, Spanish for *the workshop*— that would focus during that part of the year to the development of the innovations that would enter the menu the following season. The establishment of a research lab attached to a restaurant was a first in the world and it allowed the team to physically and economically split the production from the research parts of the enterprise. This new organizational and functional structure led to an implementation in separate environments of the two processes described in the Geneplore model of creativity by Finke, Ward, and Smith [9]. The second decision has to do with the above-mentioned self-study that the team started in

2002 and led to a full process of knowledge management that includes the full documentation of preparations, dishes and experiments.

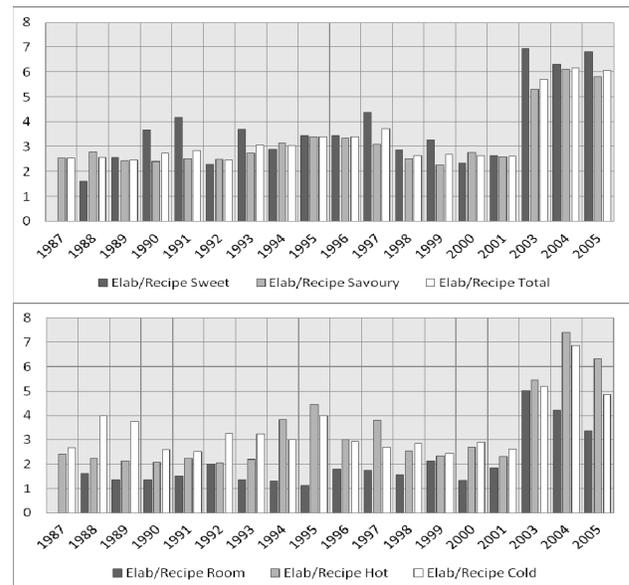


Fig. 7. Number of preparations by recipe grouped by *World* (top) and *Temperature* (bottom).

This has resulted in both a considerable impact on clients and experts alike, and also in an outstanding increase in the numbers of elements and dishes that they are able to produce in a single period. It is equivalent to a major redirection according to the propulsion theory of creativity [15] in how creativity in the kitchen is considered around the globe [5]. In local terms, the impact of the new method is evident in the number and variety of new dishes included in the menus. During the period 1983-2002, in which for the most part the team had been following and adapting principles and dishes of nouvelle cuisine, elBulli produced 54 new preparations. After the self-evaluation of 2002 the new creative process is completely integrated, including the physical separation of research and production, and the single season of 2003-2004 lists 45 new preparations. In terms of dishes, the period 1983-1993 gives a balance 226 new dishes whereas there are 127 in 1994-97, 370 in 1998-2002, 137 in 2003, 143 in 2004, 118 in 2005, 120 in 2006, and 125 in 2007.

All this process has a reflection in the way preparations and recipes combine. Until 2001, *dishes* at elBulli restaurant were made up by less than three *preparations* (Fig.7 top). However, in the last phase of development this number has grown dramatically to between 5 and 6 preparations by dish. There seems to be a trend to use more preparations in the world of *sweet* than in the *savoury* world.

If we look at *preparations* in the context of *temperatures*, we see that the number of preparations used for *room* temperature recipes is slightly lower than those made for *hot* and *cold* dishes (Fig.7 bottom). Until 1994, more preparations are used for cold recipes, something that gets

reversed from that year in favour of a larger number of preparations for hot dishes.

V. CONCLUSIONS

In this work we have successfully applied semantic network analysis to the study of a particular case of creativity, concluding the same results and dynamics that were underlined by experts. For this, we have developed a new query methodology for networks that allows us to extract knowledge from big data in a natural way. We think that this new methodology can be applied to other contexts with similar outcomes.

Runco ([14], 658-659) has pointed out the important connections between the complexity of human life today and our ability to foster creativity both as a reaction to evolutionary changes and as a force that contributes to change and evolution. This entanglement of creation and complexity is specially noticed in enterprises that have global dimensions. Cooking is one of these human activities. Whether we look at the medical problems in Western countries provoked by unhealthy habits and defective food consumption, we analyze the trade disputes around food staples and the consequences they have for small producers all around the world, or we follow the intensity with which cooking professionals from different contacts influence each other across world regions, cooking is definitely a great window to look into the solutions that creativity can offer to global problems.

The case of elBulli restaurant shows a perfect example of a venture that embarked on a process of change within their own professional realm in 2002, and which has, ever since, been dragged by the intensity and effects of their ideas to end up devoting their efforts to establish a method of creativity in the kitchen that would break away from mainstream concepts and become focused on creativity itself. This method is based on a full *re-conceptualization* of cooking around the principles of *organization, philosophy, products, technology, preparations, and styles*. All these elements become nodes in a complex network that keep most of their own instances connected, a network that allows for the creation of many paths and the integration of new elements, specially *products, techniques, and preparations*. The combinatory potential of the method is unquestionable, but even more important are the effects provoked by the integration of new elements connected in surprising ways with the existing structure. Much of this experimentation has been taken over by disciples, colleagues and cooks from all over the world [5] and raised to new heights that keep astonishing clients, industry and the media.

Today, elBulli is the cornerstone of a well-developed enterprise that involves many other elements. After the closing of the restaurant in the Fall 2011 it has been transformed into a foundation focused on the study and

promotion of creativity, according to [4]. This also suggests that Adrià and his team fit within the *investment theory of creativity* [16] according to which creative people are those who are willing and able to buy low and sell high in the realm of ideas [15]. These elements complement the role of the restaurant in what we would call a creativity business around cooking. In this respect, food and cooking are the subjects of a process entirely designed to enhance and sustain the creative effort, making creativity in the kitchen the real objective of a philosophy. The opening of elBulli Foundation in 2014 is the next chapter in this effort towards an evolving and sustainable method of creativity.

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