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Creative Chaos Theory

Inductive Method for Viewing Information from an Applied Research

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Abstract

This research proposes a theory that arises from the common sphere of design and communication. It provides an inductive method to manage an initial workflow to determine and thoroughly describe the information surrounding a specific area of research. To seek answers, we find useful: How to start a research work? And how to define a study problem?; since these are questions that usually appear in the initial stage of research and put pressure on most occasions, causing doubts when interpreting an apparently disorganized information chaos that we do not understand. The Creative Chaos Theory describes the use of a qualitative algorithm, consisting of ten sequential stages, so that the researcher develops them in order to represent an abstract graphic scheme to orderly and hierarchically place the information. This theory allows to: explore the area of research from a proper perspective; describe, sort and rank information according to its relevance; propose the definition of a specific contextual framework; determine a study problem; and, later, develop its investigation until the writing of the research memory.

Keywords: Applied research; contextual framework; creative chaos; inductive methodology; scientific communication; research question.

1. Introduction

In these moments that we are going through profound and rapid changes of paradigms, the difficulties of the researchers are accentuated, either because the borders between the different fields of knowledge become more and more blurred or because the differences between the traditional research methodologies - qualitative and quantitative are less and less clear [1].

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Despite the vast published literature on research methodologies, there is little structured and published thinking about meta-research, that is, discussion and meta-reflection on the strategies that researchers themselves and research groups have used to deal with issues of their own job. This is particularly felt in the areas of Social Sciences, and within these in the areas of Design and Communication. This descriptive work is part of an active research line, in which we initially asked ourselves: What does the research activity involve?, what is applied research? or What is the difference between applied research and a project in design? The search for answers led us to define and compare: on the one hand, the activity of projecting as a way to think about something or an action to define the way and the range of means necessary to carry it out; on the other hand, how we refer to the research activity when we refer to a generalized investigative activity that does not determine the way to perform this activity nor the time period to do it. This approach allows us to consider that project and research activities are initially different but, at the same time, they can be complementary if the stages that are performed in each activity are synchronized. From this position, our question arises: How can they complement each other?

Thus, we observe that the activities of projecting and researching are possibly complementary, but they keep different temporal structure and extent. The action of projecting through a specific process involves a short-haul activity, while researching involves a medium or long-haul activity. The two activities are developed in different ways both in the academic and business fields; while the project acts as training in the operation so that the student intervenes as in professional practice, the research forms in the theoretical reflection that enables the argumentation of the facts from an academic/scientific perspective. Both activities have in common that they depend on means and resources for their development and require strategic, operational and management decisions like any business activity. Therefore, we understand that both need to manage their structure and resources in a concrete way to achieve the results that can make them evolve and make a profit in order to survive. This research's perspective allows us to state that both activities have a common denominator. That is evident when these two activities focus on the same area of research, and we can observe how they share information from the same contextual framework. Therefore, the only difference is the method they use to interpret the data they can collect. Considering the importance of this common denominator, we think that the application of the Creative Chaos Theory can be used as an inductive method to help define a projective investigation and an applied research in design.

2. Materials and Methods

2.1 Creative Chaos Theory

FORMAL DEFINITION

It arises from the common sphere of design and communication. It initially focuses on a profile of a creative researcher, accustomed to using the different schematic expressions to visualize their ideas.

It provides an inductive method to manage a workflow to determine and thoroughly describe the information surrounding a specific area of research.

It describes the use of a qualitative algorithm[1], consisting of ten sequential stages, so that the researcher develops them in order to represent an abstract graphic scheme to orderly and hierarchically place the information.

This theory allows to: explore the area of research from a proper perspective; describe, sort and rank information according to its relevance; propose the definition of a specific contextual framework; determine a study problem; and, later, develop its investigation until the writing of the research memory.

REASONING

It is common in the field of research to understand that a “theory” serves as a set of rules, even of practices, when these rules, as principles, are thought with a certain universality and also when they are abstracted from the high number of conditions that nevertheless necessarily influence its application. Our interpretation of the term "chaos" serves to express the sense of ignorance that the researcher has when trying to explain a problem that he/she does not understand. Possibly the concept of "chaos" does not exist, and this feeling is expressed in the face of the exposure of a certain order that he/she still cannot interpret. The author Fernando Moreira da Silva [2] reflects on how the research mostly deals with analysis, while the project process in design focuses on synthesis. Both processes, research and projection in design, incorporate analysis and synthesis, but the importance of these in each of the processes is different. However, the researcher's personal opinion is not allowed to have a role in the interpretation of the information by personal preferences (subjectivity). In general, and in terms of procedure, whether in research in design or design itself, different methods are used, although they often cross or coexist. The authors Pozo-Puértolas and Martínez Bouza [3] propose the compound term “applied research in design” as the production of knowledge with direct application to the problems of society or the productive sector in which the creative component acts as a link between theory and praxis. The authors Prince and Felder [4] establish a contrast between the traditional deductive and the inductive methods. Thus, they highlight: the questioning of information; the critical attitude; the analysis; the assessment of evidence for and against each position; the critical reasoning; forming opinions; and the attempt to answer questions as those that are enhanced through the inductive method.

The author Pozo-Puértolas [4] explains how in the design specialty, abstract or representative schemes are usually used as tools to materialize creative ideas, with the subsequent purpose of arguing them visually and applying them in a design project. And this way of working can possibly be used in applied research in order to visualize and structure the information.

Joan Costa [6] explains how the ideas are formed in mind and the strategies of creative imagination: "Ideas are virtually in the space of the mind. Unstable and ephemeral forms that intuition discovers and reason explains. These ideas that are formed in the mind follow the logic of simplicity in their search for knowledge or solutions to problems. And the most appropriate and efficient way to explain these ideas is to “translate” them through visual languages that are able to show and demonstrate: images and schemes”. The authors Hernández,

[1] Qualitative algorithm: it forms a flow of sequential stages that must be developed to obtain a result.

Fernandez, and Batista [7] in their work *Metodología de la Investigación*, indicate the proper criteria to develop a research based on the study problem that arises. All of this allows us to defend that the Creative Chaos Theory provides an inductive method that triggers the researcher, based on work techniques that are routinely used in the fields of design and communication, since it proposes a way to translate and interpret a particular state of information chaos, with the intention of finding answers from the most appropriate perspective to develop applied research in design.

3. Results

With this theory, we describe an initial workflow through a qualitative algorithm configured by ten sequential stages. With the development of these stages, we will be able to represent an abstract graphic scheme that allows us to translate and interpret from a previously defined perspective. Being aware of the possible subjectivity of the use of this theory and the data that can be obtained, we highlight the importance of determining the situation and perspective of the researcher, and how he/she is available to interpret all the study units detected in the area of research. Therefore, the quality and reliability of the information obtained by applying this theory will directly depend on the level of precision or rigour that the researcher applies at each stage of the workflow.

DESCRIPTION OF THE QUALITATIVE ALGORITHM

It begins in the approach of a research work and leads to the visualization of the contextual framework of a research area.

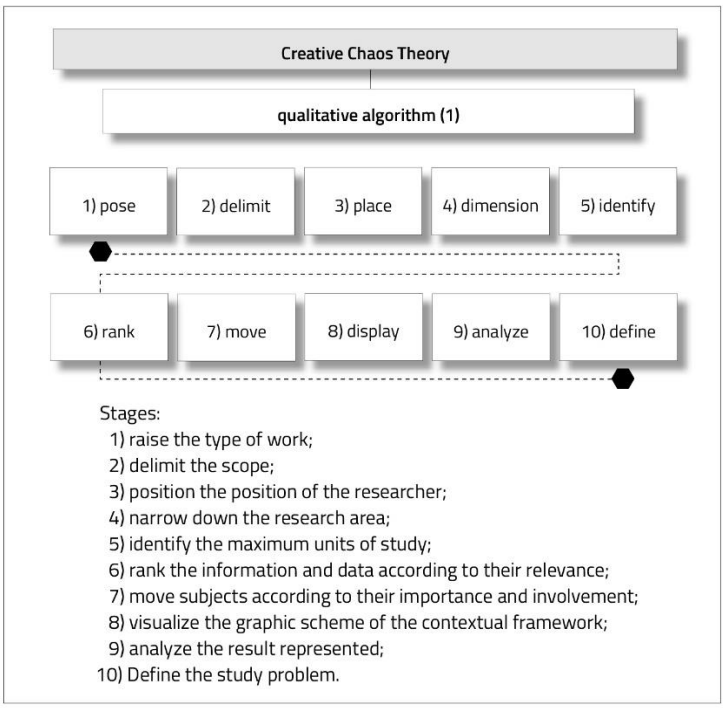

Figure 1: First qualitative algorithm of the theory.

In figure 1, we present the qualitative algorithm that is proposed to initiate a new applied research in design. It is composed of ten sequential stages. With the application of this inductive method, the researcher will be able to: explore the area of research from a proper perspective; describe, sort and rank information according to its relevance; propose the definition of a specific contextual framework; determine a study problem.

Stage 1: Propose the type of work

The research activity involves a set of phases subjected to generic standards of scientific action and should be considered as a key element: in the evolution and development of business and industrial activity; as well as in the evolution of higher studies, in universities and polytechnics, because through it the relationship between teaching and research functions is achieved. Therefore, the researcher should organize their work according to the professional or academic field in which they will develop it.

Stage 2: Delimit the scope

At this stage, the researcher should try to visualize a possible final result, more or less coherent. Thus, they should ask: how far do we intend to go with the research work? Not forgetting that the Higher Education field is regulated by "degrees" and these determine the scope of research work.

Stage 3: Establish the observation position to interpret

At this stage, the most appropriate observation position must be established from where the researcher has a perspective that allows exploring the correct action. Usually, the most appropriate position is the one that allows the researcher to observe without intervening so as not to condition the results. This is the only way to demonstrate the objectivity required by scientific research.

Stage 4: Identify the maximum units of analysis

At this stage, the units of study that are manifested in a research area (main subjects, influential secondary subjects, among others) must be identified with a certain logic. The main objective is to detect as much information as possible, depending on the means and time available.

Stage 5: Narrow the research area

At this stage, we must address the research area where the facts occur to start a detailed exploration.

For this we must:

- delimit the area where the facts occur;
- detect the relevant information;
- describe the possible subjects and their interaction;
- comprehensively and thoroughly document the data achieved;

- define a study area.

Stage 6: Rank the information according to its relevance

At this stage, we must sort and rank the information according to its relevance. From a macro and then micro perspective, we must sort the data at the different levels of importance. In short, this stage has to provide information on what is happening and what has happened in this area of research.

Stage 7: Describe the subjects according to their importance and involvement

At this stage, the profile of the subjects will be described, and how they intervene in the study area and also how they interact among them. An exhaustive description must be done to allow the researcher to know as much as possible about these and also their possible synergies and relationships.

Stage 8: Represent the abstract graphic scheme Visualize the Contextual Framework

At this stage, a possible contextual framework should be represented through an abstract graphic scheme to delimit research.

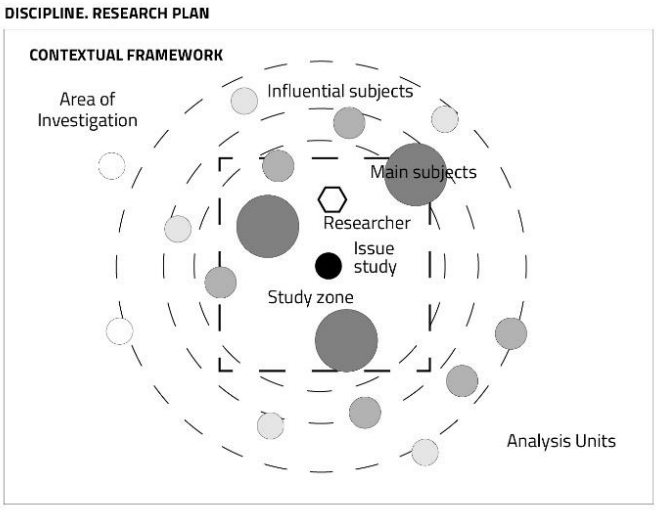

Figure 2: Representative example of the abstract graphic scheme.

Units of analysis that are placed in the scheme where we must represent:

a) The main subjects. They combine the maximum information and data to analyze in relation to the study problem. The size of the circle will be used as a reference to compare them.
b) The conditional subjects. They directly or indirectly condition the main subjects. They are represented in smaller circles than the ones used for the main subjects.
c) The observers. They are references of other people who have addressed this issue through their works or who are researching it. They are represented in small ovals with a central point.

d) The points. They refer to studies, reports or other data. They are represented in smaller circles than the conditional subjects ones.
e) The person who researches. It is the position of the researcher in relation to all the units of analysis that are distributed in the research area. They are represented with a hexagon with a central point.
f) Dashed line circles. They mark the boundaries of concentric circles' radial area. They also define the level of approximation between the data and the study problem.
g) The dashed line square. Delimits the study area.
h) The central circle. Where the study problem lies.

The process of representing the abstract graphic scheme: first, with a description of the possible units of analysis that set up a discipline; second, we place and narrow the research plan in order to represent a possible order and hierarchy of these units of analysis; third, we configure a possible contextual framework concerning a study area to start a possible interpretation of the data that is displayed.

Stage 9: Interpret the result represented

At this stage, the research problem must be determined as a starting point for exploration. Every problem emerges as a result of some difficulty, question or doubt that arises from a need. A situation (starting point) and objectives, the frame of reference and the description of instruments depend on the problem and the objectives.

For this purpose, we can ask ourselves these questions about the main subject of the research:

What?	What will we research?
Who?	Who intervenes?
How?	How do we propose to develop it?
When?	When are the facts developed?
Where?	Where is the study placed?
Why or what for?	Why do we propose this study?

What is it important for?

Delimiting the circumstantial context and the physical environment within which the researcher will carry out their work can generate, in one way or another, very different results, depending on the time and place in which it is performed. The contextual framework influences the general and specific objectives because it provides the particular features that are considered most important for determining the theoretical framework. It also provides specificities and qualitative arguments of the subjects or the environment in which the research is carried out. From the contextual framework, the information will arise to define: the research problem; the general and specific objectives; the object of study and how to define the theoretical framework of the research.

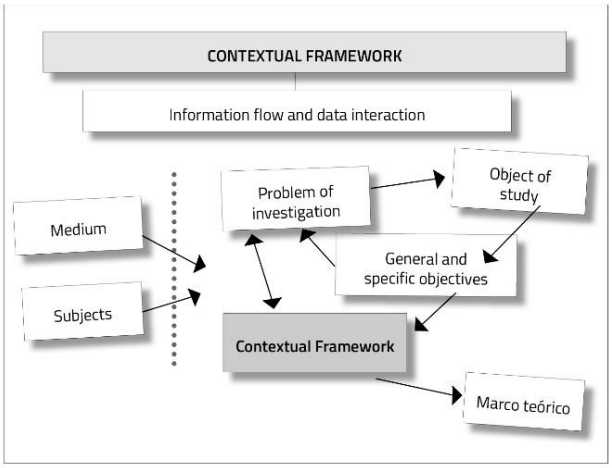

Figure 3: Representation of the information flow and interaction of the data of a contextual framework.

Stage 10: Define the study problem

At this stage, the study problem must be defined by arguing the reasons why research should be carried out and what are the contributions derived from it. Therefore, the justification phase of a work must include the following sections: magnitude, significance, impact, feasibility (available resources of all kinds) and vulnerability. In figure 4, we provide the possible issues to be taken into account when validating the study question.

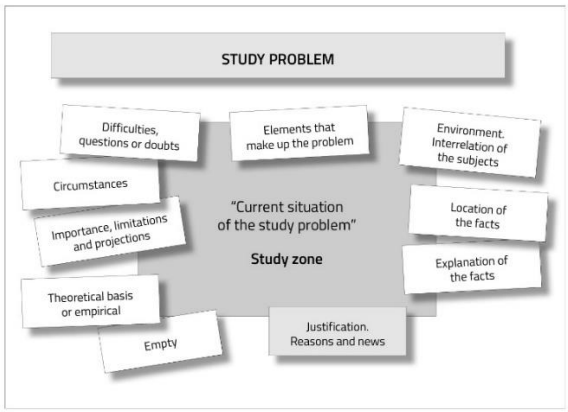

Figure 4: Representation of the issues to be taken into account to validate the study problem.

4. Discussion

As we have previously remarked, this theory arises from an active research line, in which a total of 47 preliminary essays have already been carried out in different areas of research related to design and communication. All the essays have been carried out in the academic field between the 2015-2016, 2016-2017, 2017-2018, and 2018- 2019 courses at different degrees of higher education: 28 final research projects and 19 postgraduate research projects. Since this work only aims to describe this theory, we ask for the reader's

understanding because, due to the information's confidentiality in these research projects, we cannot offer concrete data at the moment. If we can highlight: from the teaching perspective, the use of the inductive method facilitates the relationship and the task of the person who researches with the person who advises on the monitoring and analysis of the results obtained; and, from the results obtained, the students who have participated in these essays have demonstrated the acceptance of the method provided by this theory, stating that they have proven its abilities to:

- get a broader perspective of their area of research;
- place their objective perspective on exploration;
- rank the information obtained according to its relevance;
- propose a contextual framework;
- define their study problem;
- develop well-informed applied research;
- finish their work as planne

These results invite us to defend the possible effectiveness of the application of this theory to activate the development of applied research and project inquiry, in the higher education field and we consider that possibly in the business field too. Currently, in 2019-2020, new essays are being undertaken to validate the results obtained, in a total of 34 students from different levels of higher education carrying out: 7 degree research projects, 20 postgraduate research projects and 7 doctoral research projects.

5. Limitations and restrictions of the study

The results of the tests carried out so far have allowed us to define the Creative Chaos Theory as a real state that supposedly restricts the researcher in the initial stage or exploratory phase of an applied investigation. Those tests were conducted with researchers with some professional experience who were able to gather a lot of information on the subject, but not to visualize the contextual framework of their research. We consider that the next trials should be opened to other profiles of researchers in order to assess the feasibility of the theory and the effectiveness of the inductive method we propose. We should also expand these tests in the various degrees and specialities of higher education, and in the business framework to evaluate the effectiveness and possible synergies between researchers with different profiles.

6. Conclusions

As we have already mentioned in the introduction, we face a certainly complex paradigm, an evident proof is shown in the way of understanding the research activity in the areas and specialities that took part in the tests carried out (Humanities "Design"; Social Sciences "Communication" Engineering "Graphic Technology", and others). We also observe how complexity increases when, for reasons of the research topic, different subjects of different specialities have to intervene in the development of a research. Hence, we believe that the way of understanding and addressing the role that corresponds to them in the investigation will be decisive in the results that are intended to be obtained. We also observe how this problem has a direct reflection in the different

degrees of Higher Education (University and Polytechnic) and in its relationship with the business and industrial sector. In this context, we believe that the development of new working methods and techniques can favour the development of applied research as an effective mean of connection between generating new knowledge, experimenting, and applying proposals to obtain results aimed at innovation. Particularly in higher education in the areas of Design and Communication, the use of strategies associated with Creative Chaos Theory will allow junior researchers (masters and doctoral students, for example) to obtain greater autonomy, while enabling them to simultaneously produce a work of applied research of high scientific rigor. All this allows us to sustain that: The Creative Chaos theory makes it easier to determine and visualize the information that configures a contextual framework of applied research. Thus, it is useful in order to start a research project. The Creative Chaos theory proposes a qualitative methodology that operates through an inductive process, to move from the chaos of data and information surrounding applied research to a certain order that can be interpreted. Therefore, it makes it easier to define a study problem. The Creative Chaos theory can be used as a link between project inquiry and applied research in both higher education and business fields, in several areas of knowledge. The Creative Chaos theory allows: a perspective of the area of research; a way of ranking information according to its relevance; to propose the definition of a specific contextual framework; and, finally, to be able to define a study problem for the development of applied research.

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