BREAKING DOWN THE BARRIERS BETWEEN DISCIPLINES: ART AS A NEW APPROACH TO INNOVATION

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Brief autobiographical note: Sara Fernandez Garcia is in the third year of her part-time PhD program at the University of Nantes. Her research turn around the dynamic relationship between art and innovation particularly focuses on the intermediation in the collaborative efforts between artists and R&D teams as a lever for innovation.

Summary:

This paper presents a literature review on the participation of artists in innovation and their contributions to sustainable development.

Firstly, a historical analysis of disciplines shows their influence on the compartmentalisation of knowledge, reinforced by compartmentalised education systems. Secondly, the theories of transdisciplinarity and Oxman's circle of creativity demonstrate the capacity of artists to open up new fields of possibility and reinterpret social concepts.

Authors such as Lester and Piore have attached great importance to artists in third-generation innovation, this paper explores also why.

The fieldwork consists on direct observation and semi-structured interviews as part of a European project aimed at reshaping the media value chain. The interviews explore the experience of the participants and the intermediation methods applied.

The aim is to observe the capacity of artists to influence innovation and to explore collaborative processes to develop new forms of knowledge.

Key words: open innovation, art, innovation, transdisciplinarity

Introduction

Historically, there have been parallels between artistic movements and industrial revolutions. In his work highlighting the relationship between art, science and technology, Elmongi (2019) presents correspondences between scientific discoveries and their correspondents in the world of art. He makes the association between Kepler's theories on the ellipse and the oval structures so widespread in the Baroque period, and similarly between the Einstein theory of relativity and Duchamp's futurism. It seems that the social, cultural, and historical context contributes to the acquisition of general and period-specific knowledge (as a form of serendipity - Ross and Copeland, 2022), which develops in various forms due, according to most authors, to different perspectives on the context. Traditionally, we talk about classification by discipline.

With the arrival of the Encyclopédie, the division into clearly differentiated disciplines became a reality (Groult, 2020). According to Osborne and Dillon (2008), this separation, with its strong disciplinary boundaries, favours a utilitarian vision of creativity and knowledge, with a consequent devaluation of the disciplines. On the one hand, we see a devaluation of the disciplines traditionally linked to creativity, and on the other, we lose the ability to explore, thereby closing off the possibility of exploring disciplines beyond their preconceptions. Braund and Reiss (2019) speak of the boundaries reinforced by a culture of obedience and performance embedded in school systems, which runs counter to a more open

curriculum and epistemology, where collaboration and creativity contribute to investigative and problem-solving approaches.

For these two authors, the sciences were considered to be the product of critical thinking before they were the product of creative thinking or inspiration. Yet a number of scientists repeatedly mention the importance of creativity in their thinking, their research and their discoveries. In any case, Braund and Reiss indicate that this is largely due to the fact that critical thinking is perceived as a set of cognitive skills operated vertically and used for decision-making in complex but logical situations. This has historically scorned and devalued the cognitive skills of creative thinking.

However, Amabile (2019) tells us that creativity skills are generally characterised by a cognitive style capable of easily understanding complexities and the ability to break problem boundaries (or explore new cognitive pathways) in the search for a solution. In her view, this idea had already been mentioned by Boring (1950), Katona (1940) and Wertheimer (1956). The characteristics of each type of cognitive style are relevant to creativity. "*Cognitive style is each person's own way of perceiving, evoking, remembering and therefore understanding information perceived through the different sensory modalities available to them when faced with new knowledge"* (Flesseas, 1997).

These days, we face very different challenges. We have moved on from traditional Schumpeterian innovation to disruptive innovation processes. However, these innovations have shown their limits in the face of these challenges. This is why new innovation approaches are emerging, notably open innovation (Chesbrough, 2003), also known as "third-generation innovation" (Lester and Poire, 2004). Open innovation calls on resources both inside and outside the organisation, with the idea of collaboration and sharing skills to create new knowledge. However, can we push the boundaries of this collaboration further and value different cognitive styles?

1. Anti-disciplinarity: utopia or systemic driver of innovation?

Braund and Reiss (2019) consider that critical thinking and creative thinking should go hand in hand and work together to solve multi-level problems. New trends in knowledge development seem to support this.

In her work 'The age of Entanglement', Neri Oxman (2016) sets out an 'anti-disciplinary' hypothesis in which knowledge can no longer be attributed to or produced within disciplinary boundaries, but is wholly entangled, so that projects can reside in multiple domains. Oxman develops in his theories the Krebs Cycle of Creativity (CCC): a map that describes the perpetuation of creative energy (Creative ATP or "CreATP") whose four modalities of human creativity are science, engineering, design and art.

For Oxman (2016), art and science represent human needs to express the world around us: "to face their reality, to make sense of it". Similarly, the relationship between design, art and engineering is also interlaced. To the point of saying, "It's likely that if what you design carries meaning and relevance, you're not operating in a single distinct field."

This is also supported by Ross and Vallée-Tourangeau's (2021) theories of serendipity. According to their work, qualitative research on creativity often highlights the role of accidents in the creative process, undermining the cognitive context of creativity. These so-called accidents make up the study of serendipity, which enables us to understand the interaction between a person and these chance events, or better put: "the implementation of an environmental chance by a prepared mind". These accidents enable us to understand the interaction between a person and their historical, social, cultural and evolutionary environment. Ross and Vallée-Tourangeau thus consider that in the creative process, the creative ecosystem needs to be broadened to encompass the objects and people who play an active role. By moving from a linear theory to a looping, reciprocal process. His model suggests that the creative act, of whatever kind, cannot be reduced and focused solely on the properties of either the person or the context, but must rather take into account the way in which the creative moment emerges from the interaction of these two data.

The boundaries of knowledge that we have imposed on ourselves with the separation of disciplines and their interaction clash directly with these ideas of intertwined knowledge and prevent a deep exploration

that navigates for all forms of human understanding and its skills. It is worth asking whether this is not in fact the true hybridisation of fields.

2. Innovation and cross-functionality: using art to move forward

As mentioned above, we have moved on from the more traditional Schumpeterian form of innovation to disruptive innovation processes in the wake of the race for competitiveness mentioned by Lenfle (2016). However, these innovations do not seem to provide a sustainable response to the issues at stake, because they sometimes fail to take account of social usefulness and needs in their approach, or even of contextual reality. Some stakeholders talk about the need for more responsible innovation defined by Stilgoe, Owen, Macnaghten (2013) as that which "consists of caring for the future through collective management of science and innovation in the present."

The system has also understood the importance of opening up the fields of possibility towards open innovation (Chesbrough, 2003) or "third generation innovation" (Lester and Piore, 2004). In this way, open innovation cuts across disciplinary exploration and shifts forms of work from cross-disciplinarity, inter-disciplinarity and multi-disciplinarity to trans-disciplinary or anti-disciplinary forms of work (Oxman, 2016). Some authors consider that the latter two are in themselves a form of utopia, the tendency of which "consists in the desire to traverse all these approaches, results, points of view, etc., with a view to identifying elements that cut across all the disciplines" (Lionel Dupuy, 2021).

In any case, we are seeing new working techniques in this direction, such as the research approach of Ars Electronica Futurelab, which is based on a transdisciplinary concept: at the interface between art, technology and society, and on a constant dialogue about the future (as a form of anticipation). The laboratory explores the realisation of visionary concepts for innovative businesses, social life and the creative sector. The process proposed by Ars Electronica consists of 3 phases: inspiring, envisioning and prototyping.

In fact, Sandberg (2019) notes that in a complex and rapidly changing business world, where planning is subject to increasing uncertainty, creativity has become an essential resource. "When tried and tested models of action don't work, it's necessary to adopt approaches that help develop new ideas and make them sustainable."

This is where art can be used as a tool to overcome limits and go beyond fixed boundaries. Lester and Piore (2004) advocate the importance of artists in this 'third-generation innovation' because of their training and experiential learning.

In these interactions between fields, all parties have much to gain. For the more technical fields, this interaction can be a source of new ideas and questions, offering new points of view and breaking down their preconfigured frameworks. Artists see new possibilities, tools and methods for expressing their ideas, paving the way for artistic innovation.

3. Art at the service of innovation
Art as a means of accessing new knowledge
Braund and Reiss (2019) suggest that art stimulates the brain in a different way to traditional science. In addition, their studies indicate that close collaboration between science and art generates a broader accumulation of knowledge and skills, which can lead to potential innovations. In this way, artists have a willingness to question, an acceptance of uncertainty and a closeness to and understanding of social issues (including consumer needs). So, for these authors, artists have the capacity to experiment and iterate, by facing up to uncertainty and even incorporating it into their processes.

For Sandberg (2019) the potential of these collaborations lies in revealing implicit knowledge and exploring divergent thinking.

Art as a method of questioning

Similarly, Lester and Poire (2004) place great importance on artists in 'third generation innovation' because of their critical thinking, training and social understanding. All this is reinforced by the theory of Neri Oxman (2016), who questions the role of art, science, engineering and design in her cycle of

creativity. She reviews their interactions and the added value they bring to each other. For Neri Oxman, the role of art is to question uses, probe behaviour and create awareness of the world around us (using its social and historical perception). Art will convert practices by denouncing perceptions and behaviours and by providing new information that will give us a reflective view.

Bureau (2019) supports this same idea by calling for training in the 'improbable' for new generations as opposed to the standardised solutions of current managers. Similarly, for Sandberg (2019), whose "planning" is "subject" to uncertainty, seeking new approaches that are less analytical and rational is vital. For the author, the artist is capable of mastering the ambiguity of uncertain situations and producing inspiration without self-limitation ("inventive rule-breaking").

Artistic techniques as an adaptation to uncertainty

Furthermore, Lester and Poire (2004) and Sandberg (2019) also highlight the ability of artists to navigate ambiguous and uncertain environments as a key skill in the complexity of the VUCA (Volatility, Uncertainty, Complexity & Ambiguity) world. According to Sandberg, the artistic process consists of "exploring unknown paths, radically changing direction if necessary, taking detours, abandoning failure and starting afresh". For him, the artistic method thus differs from the dominant rationalism and openly adapts to different interpretations of reality, due in part to non-linear exploratory movements (Sandberg, 2019).

It is legitimate to say that the artist occupies an important place in the questioning and exploration of new perspectives, which contributes to the generation of more adaptive knowledge and the opening up of new possibilities. It is also legitimate to question the way in which worlds that are usually separated can work together, and the forms that this intermediation will take.

In any case, there is a real interest in integrating artists into the processes of sustainable development to open up the fields of possibility, question the ideas that are already conceived, break the limits of disciplinary thinking and commandeer social needs.

4. Methodology envisaged and field being explored

In order to explore the position of the artist in innovation processes, we plan to carry out a field observation using qualitative data, which is currently being collected. Among the methods chosen for the case study, we will be conducting semi-directive interviews with the project's stakeholders.

This is the European MediaFutures project, an incubation and innovation hub focusing on Big Data in the media value chain. The project started on 1 September 2020 and has been co-financed by the European Commission as a continuation of the STArts project and its ecosystem. STArts is part of Horizon 2020 and is based on two of the axes, namely societal challenges and competitiveness and innovation within the European Union, all with an interdisciplinary approach. With Horizon 2020, the EU also wanted to cover the entire innovation chain, from idea to market, by strengthening support for the commercialisation of research results and business creativity.

MediaFutures is a transnational European data-driven innovation consortium that has brought together startups, artists and, unusually, a few SMEs. Their aim is to extend standard media models based on Big Data and "propose unconventional ways for people to engage in quality journalism, science education and democratic processes" (MediaFutures page). The project aims to create products, services, digital artworks and experiences that will reshape the media value chain through innovative, inclusive and participatory applications of data and user-generated content.

The project explores the relationship between democracy, citizen action and Big Data technologies in an era of polarisation and misinformation, with data seen as a common good and a public infrastructure. MediaFutures believes that a society that bases its decisions and policies on data is more likely to be healthy, productive and sustainable.

For the project, the development of information and communication technologies in political and governance processes is more likely to succeed if a bottom-up approach is adopted, involving citizens and diverse groups in its creation. Consequently, MediaFutures has encouraged participation and

inclusion, particularly of under-represented audiences and communities affected by the digital divide. The ultimate aim would be to pave the way for a new form of inclusive innovation, fuelled by transparent access to data and multidisciplinary expertise.

MediaFutures has distributed €2.5 million to 51 start-ups or SMEs and 43 artists through three tracks opened over three years from 2020 to 2023:

I.   Artists for Media: a residency for artists proposing new ideas and experiences that critically and materially explore data and technology to question their impact on individuals and society.

II. Startup meets Artist: part of the programme combining "the ingenuity of entrepreneurs and the creativity of artists to accelerate innovation". Teams were made up of a start-up and an artist or arts company working together to develop a new concept in data technology and the arts. The projects supported led to experiences that made data exploration both entertaining and informative, drawing on products, services and technologies used or developed by the startup in collaboration.

III. Startups for Citizens: a track dedicated to startups that have developed innovative products, services and business models that encourage wider and more meaningful engagement with information and the way it is communicated and shared. This part of the project focused on the areas of journalism, science education and digital democracy.

The selected candidates took part in a six-month acceleration programme (for start-ups and SMEs) or residency programme (for artists), which included funding, mentoring and training. The three tracks explored different forms of work, one of which was completely dematerialised due to the Covid-19 pandemic, and resulted in a wide range of projects, from educational games on fake news and its path (https://mediafutures.eu/head-radio/) to studies on misinformation and fake news in the form of documentaries and marketing studies (https://mediafutures.eu/projects/fakingne-ws/).

With this study, we would like to explore the capacity of artists to influence innovation, and above all the processes of this collaboration and the usefulness of intermediation in developing new forms of knowledge.

5. Conclusion

As we have seen, the literature would seem to support the hypothesis of art as a lever for innovation and the way in which artists can propel social innovation with their questioning and perceptions. Similarly, the resilience of artists makes it possible to relaunch projects and formats which, under other conditions, would be left on the sidelines.

The cognitive skills of the artists involved in the process enable them, on the one hand, to contextualise reality socially and question current society beyond the realms of possibility. They also decontextualise our tools and present a forward-looking vision of the imagination. It is not insignificant that art, artists and free thinkers had been the first targets of authoritarian regimes (see the process of denigration of so-called "degenerate" art during the Third Reich, Landa 2004). These questionings are integrated into the process by harmonising social reality and the process of innovation towards more sustainable and thoughtful projects. In addition, their ability to manage uncertainty and integrate it into their activity in order to find solutions and confront their impossibilities helps to break down preconceptions, opening up the field of possibilities that will generate new knowledge.

Our initial results in the field seem to confirm this ability to go beyond preconceived ideas and establish a foundation of new knowledge. The projects in MediasFuture explore Big Data in a myriad of forms. Some of these projects have looked at misinformation and the workings of the digital ecosystem, highlighting a space driven by market profit and controlled by algorithms pursuing the same objective. The Invisible Voice project, for example, has developed a free browser plugin that enables individuals to make informed decisions about the websites and companies they use.

Other projects worked on the processes of demystifying fake news and its militarised use and manipulation of the masses, culminating in a research project and an art project, both aimed at raising awareness of the risk of disinformation as a weapon of war. To do this, they used aggressive narratives

in government-controlled media that isolate public perception from reality. The research part of the project uses quantitative and qualitative methods to analyse data from large datasets in order to draw meaningful conclusions for the presentation. The artistic part of the project aims to integrate the results into an interactive multimedia medium.

These are just a few examples of the issues addressed in the MediaFutures project, a field that is still being explored. Semi-structured interviews are currently being conducted with artists, start-ups and coordinators. Subsequently, we would like to explore how the intermediation between the artists and the start-ups facilitates collaboration between these two parties in the project and thus also participates in the creation of this new knowledge.

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