Sylvain Fleury, Simon Richir (2022), *Immersive Technologies to Accelerate Innovation: How Virtual and Augmented Reality Enables the Co-Creation of Concepts, Smart Innovation*, London, ISTE, 192 p.

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In Journal of Innovation Economics & Management Volume 40, Issue 1, 2023, pages 267 to 271
Publishers De Boeck Supérieur

ISBN 9782807399525

TRENDS AND COMMENTS

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Companies in the 21st century are facing extremely rapid societal and technological changes. They must constantly reinvent themselves to survive and to provide solutions that meet consumers' needs. These needs are themselves subject to changing mentalities, evolving awareness and societal objectives set by political and economic organizations. We have witnessed this for years with the successive IPCC reports on climate change and its current challenges, but also with the Covid-19 pandemic that has affected the planet and we have seen this even more recently with the Ukrainian crisis.

These events, which have occurred in a context of advanced globalization, require us to adapt our models and to leave our comfort zones. They force us to review our consumption models towards more sustainable ones and reinvent even our model of economic, energy and environmental, technological and food sovereignty. How can we adapt to these challenges in a context of shared knowledge and globalized trade?

This is where the notion of innovation comes in. It is about turning ideas, wherever they come from, into products or services that really make sense and respond to these new needs and challenges. The different innovation processes described in this book and the use of digital, immersive, and

DOI: 10.3917/jie.040.0267

interactive technologies within these processes, pave the way to new uses and practices, favoring the integration of different actors in co-creation processes.

This book presents, among other things, the "Time-To-Concept" (TTC) method, whose name originates from the ambition to reduce the time existing between the emergence of the idea and the innovation itself. It is a toolbox for all company managers and innovation teams that answers several questions they might have about integrating these technologies into their processes. It is a book that supports the digital transformation of companies through experimental research and the development of digital tools to support the innovation and product creation phases.

Numerous initiatives have emerged to provide consumers with answers for the adoption of more sustainable consumption behaviors. The TTC method contributes to give rise to design processes such as "Do-It-Together" (DIT), which combines co-creation practices using immersive technologies, with social manufacturing concepts, while guaranteeing digital fluidity throughout the creation chain. The objectives of this DIT approach are, among others, to improve the customization capabilities of manufactured products by the consumer, while facilitating the work of designers and manufacturers, as well as their exchanges with the consumer. In this open manufacturing logic, manufacturing can also be relocated close to the consumer.

Sylvain Fleury and Simon Richir begin by presenting the reasons why a company must innovate, with concrete examples of what has happened to leading groups when they have not been able to adapt to societal or technological changes. The concept of creativity plays an important role here and is defined as a process for creating ideas, where innovation is the way to implement them. Different innovation strategies are presented. Fleury and Richir describe the technological and human problems that this process from ideation to innovation brings to companies and the need to equip oneself with tools and methods to face challenges. They conclude this first chapter with the importance of the sketching process in these first phases of idea generation, how to control the efficiency of this process, and what tools exist today to accompany this phase (drawing, touch, Augmented Reality - AR, Virtual Reality - VR, Artificial Intelligence -AI).

Chapter 2 focuses on the process of creativity itself. Fleury and Richir are interested in the "*factors and biases of the mental processes involved in creative activities*". They first contextualize the different models of individual or organizational creativity in the literature and look at all the factors that seem to influence the performance of individuals in these activities. Section 2.5 is the essential toolkit summarizing the identified cognitive biases that can occur in a creativity workshop.

While the previous section focuses on factors relating to individuals, Chapter 3 looks at the influence of the environment on creativity. We learn the essential role of making the environment conducive to the envisaged activities through the definition of zones and colors but also the movement of the user within this environment. Environments evoking nature seem to improve performance, and colors have a role to play depending on whether we are in a divergence or convergence phase. Fleury and Richir also validate the transposition of these rules when creativity takes place in virtual environments: "*even in a virtual environment you are more creative when you are in motion in a natural environment*". Another essential criterion presented by the authors is the representation of self and others through avatars. "*You perform differently in the virtual environment depending on whether your avatar represents a creative person, or when its attractiveness is high*". When these parameters are considered, ideation in virtual reality in a relevant environment (artificial or 3D scanned) saves time and iterations.

Chapter 4 introduces four user-centered innovation methods. The authors compare Design Thinking, Double Diamond, Lean User eXperience and Time-To-Concept. They analyze the steps of the different methods, their objectives, and their limitations. They discuss whether one method is more suitable for incremental or disruptive innovation as well as the notion of uncertainty in innovation. The TTC method is described as an extension of Design Thinking and illustrated by the presentation of a concrete project framework. Fleury and Richir present the six main principles of this method: Play; Move; Inspire; Sketch; Personalize; Equip. This last term is central to the TTC approach, which seeks to equip the innovation phases with immersive tools. The authors then introduce the notion of "Immersive-Storming": a new term describing the immersive version of brainstorming.

Chapter 5 focuses on problem solving methods. The TRIZ, C-K theory, Creative Problem-Solving (CPS) and Design Sprint methods are described and analyzed. Of note is the Design Sprint method, which allows for a Design Thinking sprint with the goal of getting the product released at the end of the project, as in the Do-It-Together approach. Fleury and Richir review techniques for trying to solve problems such as Lateral Thinking, Detour Techniques, Synectics and Discovery Matrices. All these methods help to introduce the essential notions of the following chapter.

In chapter 6, we discover the ideation techniques originally derived from Brainstorming defined by Alex Osborn in the 1940s. Brainwriting, brainsketching, bodystorming and immersive-storming techniques are analyzed. The authors present the advantage of being on the move in the ideation exercise and propose an "Immersive-Storming" terminology for brainstorming

activities that will use virtual immersion and all the levers it offers to boost the generation, selection, and elaboration of ideas. The authors indicate that the Time-To-Concept method uses immersive storming but also insist on the fact that this method is just as relevant in a Design Thinking or Creative Problem Solving method.

Chapter 7 describes in more details the interactive 3D tools adapted to each situation of an innovation process. One can read in the book the significant opportunity VR offers for design and more particularly for co-design. Fleury and Richir mention the possibility of using natural gestures to avoid the mental transformation of the representation between 3D on paper and 3D in an immersive world. Several studies also cited in this chapter show better performance in a creative sketching activity in immersion rather than on paper, better precision and better memorization of the models drawn. Fleury and Richir then describe the need to be able to use dedicated immersive Computer-Aided Design (CAD) tools, either as a complement to traditional CAD software or as a replacement, but always following the ideation phase. In these immersions, they insist on the notion of Spatial Inspection characterizing the action of exploring the 3D model by turning around it, and which seems to be an unavoidable key to favoring the user's performance. In order not to isolate the user in an immersive helmet, asymmetric collaboration methods are also described. The authors go into more details on the affordances and constraints of immersive-storming: negative points such as the lack of expression of avatars (functionalities) or latency (Quality of Service) are mentioned. However, immersive-storming also avoids some of the known negative effects of common brainstorming, such as social comparison or cognitive inertia. The types of immersive applications for each creativity method are then elaborated. In particular, the authors describe the importance of the environment, the context in which users are immersed. The notion of 3D scanning of the environment is then introduced.

After introducing the tools and their objectives, the last chapter proposes to establish the criteria for a good user experience to foster creativity. It presents opportunities as well as needs: for example, the lack of standardization of VR interactions and the need for tutorials to enable a user to get to grips with the system quickly. It also insists on the fact that even when using VR, the physical environment must be thought out and prepared to deploy this experience. Fleury and Richir then propose a reading of the User Experience (UX) through its psychological dimensions to understand what impacts creativity, and then describe concrete guidelines for maximizing the acceptance of these tools, from an emotional (pleasant and amusing experience), and functional point of view (such as the use of tangible whiteboards

for instance) linked to the objective set. They conclude this chapter with concrete recommendations on the usability of the tools, the notion of stimulation through the different senses to favor the generation of ideas in immersion, the development of tools specific to the type of users concerned and their own skills and the layout of the physical place that allows the deployment of the experience.

This book presents in a very pedagogical way all the commonly used innovation methods and their application frameworks. Fleury and Richir have succeeded in making a synthesis that is both easy to understand and well-supported enough to apply the right methods to the right problems. The presentation of the Time-To-Concept approach, completely focused on the problem of technological innovation tools, opens fascinating perspectives on the future of innovation methods and co-design of products or services.

As part of a process of adapting companies to new societal challenges, Fleury and Richir offer a toolbox to support companies in their digital transformation and consider concrete technological means for users of processes such as Do-It-Together.

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