



Volume 38

Immersive Technologies to Accelerate Innovation

*How Virtual and Augmented Reality
Enables the Co-Creation of Concepts*

Sylvain Fleury and Simon Richir

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Smart Innovation Set

coordinated by
Dimitri Uzunidis

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First published 2021 in Great Britain and the United States by ISTE Ltd and John Wiley & Sons, Inc.

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ISTE Ltd
27-37 St George's Road
London SW19 4EU
UK

www.iste.co.uk

John Wiley & Sons, Inc.
111 River Street
Hoboken, NJ 07030
USA

www.wiley.com

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Library of Congress Control Number: 2021943895

British Library Cataloguing-in-Publication Data
A CIP record for this book is available from the British Library
ISBN 978-1-78630-770-5

Contents

Foreword	ix
Acknowledgments	xi
Preface	xiii
Introduction	xv
Chapter 1. Innovation Management: Issues and Key Points for a Vital and Strategic Process	1
1.1. A question of survival	1
1.1.1. The example of Blockbuster Video	2
1.1.2. A regime of intensive innovation	2
1.1.3. From creativity to innovation	3
1.1.4. Equipping ourselves to innovate better.	4
1.1.5. Modeling innovation at the company level	6
1.2. The blue ocean strategy	6
1.3. Open innovation	8
1.3.1. The two types of open innovation.	9
1.3.2. The example of the MayAM challenge.	10
1.3.3. Collaborative innovation	10
1.3.4. Crowdsourcing	11
1.3.5. The lead user	11

1.4. Technical and human issues from ideation to design	13
1.4.1. The sketch as a reflective process	13
1.4.2. Types of representation	14
1.4.3. Conditions for the effectiveness of sketches	15
1.4.4. The phases of ideation	16
1.4.5. The right tools at the right time.	17
1.4.6. A growing variety of tools.	19

Chapter 2. Creativity and Cognition: Factors and Biases of Mental Processes Involved in Creative Activities 21

2.1. The creativity process.	21
2.1.1. The Wallas model (1926)	21
2.1.2. The GENEPORE	22
2.1.3. Analogies.	24
2.2. The factors of individual creativity	26
2.2.1. The individual creativity model	26
2.2.2. Investment theory.	27
2.3. Creativity and personality	28
2.3.1. The Myers Briggs Type Indicator	29
2.3.2. The Big Five.	30
2.3.3. Constituting a group for ideation.	31
2.4. The factors of organizational creativity	32
2.5. Cognitive biases and creativity	35

Chapter 3. Physical and Virtual Environments and their Influence on Creativity 43

3.1. Physical environment of creation	43
3.1.1. Interference and stimulation.	45
3.1.2. Layout	47
3.1.3. Natural elements	50
3.1.4. Colors, sounds, light and temperature	53
3.1.5. Creativity, posture and movement	55
3.2. Virtual creation environment	59
3.2.1. Avatars	60
3.2.2. Inspiring environments.	64

Chapter 4. User-Centered Innovation Methods: Design Thinking, Double Diamond, Lean UX and Time to Concept.	67
4.1. Design Thinking	67
4.2. The Double Diamond	70
4.3. Lean UX	71
4.3.1. Uncertainty linked to innovation	71
4.3.2. Definition	72
4.3.3. The Lean UX loop	72
4.4. The Time to Concept method.	74
4.4.1. An example of the application of Time to Concept method.	74
4.4.2. Managing innovation projects in Time to Concept.	76
4.4.3. The six principles of the Time to Concept method	78
Chapter 5. Some Creative Problem-Solving Methods: TRIZ, C-K, CPS, Design Sprint.	83
5.1. The TRIZ method.	83
5.2. The C-K theory	85
5.3. Creative Problem Solving	86
5.4. Design Sprint	87
5.5. Lateral thinking	89
5.6. Synectics	91
5.7. Detour techniques.	92
5.8. Discovery matrices	93
Chapter 6. All-Terrain Ideation Techniques: Brainstorming, Brainwriting, Brainsketching, Bodystorming and Immersive-Storming	95
6.1. Brainstorming	95
6.2. Brainwriting	97
6.3. Brainsketching	98
6.4. Bodystorming	99
6.5. Immersive-storming	101

Chapter 7. Immersive Tools for Every Innovative Situation	103
7.1. Design in virtual reality	103
7.1.1. The natural gesture	103
7.1.2. Links with CAD	105
7.1.3. Comparison of sketching tools	106
7.2. Co-design in virtual reality	108
7.2.1. Information capture in virtual reality	109
7.2.2. Asymmetrical collaboration	110
7.2.3. Affordances and constraints for immersive-storming	112
7.3. Types of immersive applications for creativity	114
7.4. Choosing the right creativity tools	118
7.5. Immersive tools for innovation project stages	120
7.5.1. Immersive technologies and Design Thinking	121
7.5.2. Immersive technologies and Lean Startup	123
7.5.3. Immersive technologies and Time to Concept	124
7.5.4. Immersive technologies and the creative process	126
Chapter 8. A Successful Immersive Experience for More Creativity	129
8.1. The experience of immersed users	129
8.1.1. Drawing inspiration from reality	130
8.1.2. A future standardization	130
8.1.3. User support	131
8.1.4. Physical space planning	133
8.1.5. The psychological dimensions of the user experience	134
8.2. The creative's user experience	135
8.2.1. The Creative Support Index	135
8.2.2. The design of tools for ideation	136
Conclusion	139
References	141
Index	159

Foreword

The need for change in a company often translates into a real need to adapt in order to survive, especially in a constrained environment; in other words, it is a matter of innovating or dying. This was well illustrated during recent crises, for example in 2008 with the financial crisis, when, even under reduced resources, the accelerated change toward an “open innovation” model with external partners, academics, customers and suppliers, enabled us to prepare for the rebound after the crisis. More recently, during the Covid-19 pandemic in 2020, the rapid use of digitalization and the electrification of transport are already preparing us for environmental challenges, particularly related to global warming and the necessary reduction in the use of fossil fuels. In this changing world, the innovation process facilitates change and creates a positive, continuous and visible dynamic. This process is useful for companies to focus efforts at the right time, with the right intensity, in the right place, with competent and prepared teams. The notions of market and temporality are also crucial. Without a market, innovation will only remain at the invention stage, an expense for the company with no return on investment. To be successful, this implies a continuous intimacy with customers, a shared value creation process. The innovation process must also adapt to the context and make the most of available technologies, wherever they may be, from our suppliers, our academic partners, and public or private research. The meeting with the teams working at the Laval Virtual Center and the work carried out with the *Institut Arts et Métiers de Laval* have enabled MANN+HUMMEL, a leading global company in filtration technology, to strengthen its strategy in the field of

digitalization, by seeking to create value from digital data, and by applying it to the innovation process. The speed with which we can interact with our customers in our ideation processes, up to the realization of prototypes, real or virtual, is an important factor in convincing future customers, investors and internal or external decision makers. In 2016, based on this observation, the collaboration between MANN+HUMMEL and the *Institut Arts et Métiers de Laval* was initiated in order to conduct research and experimentation on the contribution of technology, related to virtual reality, to the innovation process. This project is called “Time to Concept”, and its objective is to reduce the time between ideation and the first customer experience. It is about putting the user or the customer at the center of the game by immersing them, gathering their emotions and feedback, and taking these into account in real time to adapt the product or the service. It is also of course about converging, at the end, on a creation of value, demonstrated in the virtual environment, with system interactions made more visible. For example, during a recent car show in Frankfurt, we managed to put a few customers under virtual reality headsets to gather their impressions of a new vehicle interior filtration system: a situation lasting less than two minutes to explain everything, in particular to visualize the invisible, that is, the improvement of the vehicle’s air quality. Remembering the experience, one of them, a world-renowned car manufacturer, then selected us to create a demonstration vehicle. In the field of air quality improvement, which is one of the strategic axes of the MANN+HUMMEL Group, we try to make visible with the help of virtual reality the physical phenomena at stake, such as fluid mechanics, the propagation of pollutants and their filtration. Explaining them is all the more necessary to bring to the market new and more efficient filtration technologies, adapted to the new uses of mobility and our lifestyles, and also in tune with the new recommendations and regulations in this field. Thus, this book describes the generic results of research work validated in concrete cases to support the digital transformation of innovation within companies through immersive technologies.

Jérôme Migaud
Transportation Innovation Director
at MANN+HUMMEL Group

September 2021

Acknowledgments

We would like to thank our industrial partners for providing us with study sites and opportunities to evaluate the methods described in this book in real-life situations. In particular, we would like to thank MANN+HUMMEL for their contribution through the financing of the Time to Concept Chair, which has given rise to a number of the research projects presented in this book. We think in particular of Jérôme Migaud, Bruno Langer, Philippe Rhoumy and Luc De Keyser. Our thanks go to the *Arts et Métiers* Foundation for its support to the Chair, in particular Gilbert Paulezec and Roger Stanchina, but also Aurélien Agnès who supported us for 1 year in this scientific program. Of course, we would like to thank the representatives of the steering committee of the Time to Concept Chair: Jean Quessada, Ivan Jordanoff, Alexandre Rigal, Xavier Château and Xavier Kestelyn.

We would also like to thank Charles Mille for the numerous exchanges that contributed to the reflections on the methods and tools, and also Thibaut Gutter and Benjamin Poussard for their participation in the research work and the design of the virtual reality tools, as well as Marie-Pierre Verrier for preparing the numerous communication and scientific sharing events that punctuated this program.

Numerous scientific collaborations with researchers from our team or outside have also contributed to this work, in particular Olivier Christmann, Geoffrey Gorisse, Philippe Blanchard, Marc Pallot and Laurent Dupont.

The students of the MTI3D Master's at the *Institut Arts et Métiers de Laval* contributed to this work by realizing some of the technology elements presented in this book.

Finally, thanks to Laurent Chrétien and the great team of Laval Virtual for their logistical support and for the regular exchanges on the uses of immersive technologies that have stimulated our creativity over the years.

September 2021

Preface

In this book, we regularly refer to research work conducted by our team at the *Institut Arts et Métiers de Laval*. It is therefore not superfluous to provide a few elements of context beforehand.

The *École Nationale Supérieure d'Arts et Métiers* is a French engineering school renowned for its orientation toward the industrial world. The *Institut de Laval*, attached to the Angers campus, has developed in conjunction with the Laval virtual reality ecosystem and in particular Laval Virtual, the organizers of the international virtual reality trade show. The institute manages the MTI3D master's degree, which trains high-level students in the management and engineering of immersive technologies. The Institute's researchers form the "presence and innovation" team of the "*Laboratoire Arts et Métiers ParisTech d'Angers*" (LAMPA). The work of the team concerns not only virtual reality, user experience and use cases of virtual reality in different industrial sectors (training, health, product design, etc.) but also innovation methods and creativity. Alongside research activities, the team is led to support companies in their adoption of immersive technologies and also in their innovation processes, notably through the animation of creativity workshops.

Within the framework of the Chair entitled Time to Concept, a series of work has been completed on immersive technologies for ideation. This work has enabled the formalization and evaluation of the Time to Concept method described in this book. It is therefore

both a researcher's viewpoint that is proposed and the result of a field experience built on the basis of tests and regular feedback in real situations.

September 2021

Introduction

Humanity has always sought to innovate by inventing new products, services or manufacturing processes. Innovation is part of our DNA. The Renaissance (14th–16th centuries) was a period of greatness. Five hundred years later, we are now living in the “Renaissance 2.0”, a new period of major innovations, both great and troubled, that history will remember.

Collective intelligence, boosted by increasing network speeds and artificial intelligence, gives rise to new ideas every second across the planet. Like comets, most of these ideas fade away as quickly as they appeared, before being transformed into intelligible concepts that can be seized by the companies best equipped for innovation.

The digital transformation of companies is a competitive challenge and a complex step for large groups and industries, but at the same time a tremendous opportunity. This transformation is moving into another dimension with the development of immersive technologies and artificial intelligence. The challenge of innovation and digital transformation are now coming together as more and more research shows the potential of immersive technologies in accelerating the first steps in the innovation process.

Innovation Management: Issues and Key Points for a Vital and Strategic Process

*Systematic innovation requires a willingness
to see change as an opportunity.*

PETER DRUCKER

1.1. A question of survival

Every year since 1955, *Fortune* magazine has published a ranking of the 500 highest-grossing U.S. companies. In 2014, the *American Enterprise Institute* revealed that 88% of the companies initially included in this ranking were no longer in existence. Some had gone bankrupt, others were bought out, even though most of them had been flagships of American industry. As Joseph Schumpeter said, most companies die “of old age” when they are no longer able to innovate. Lack of innovation naturally leads established companies to disappear. These disappearances are accelerated by the arrival of new companies which, on the contrary, are born and develop in their wake. Innovation is therefore a question of survival, or at least of maintaining a dominant position.

1.1.1. The example of Blockbuster Video

Blockbuster Video is a famous example of a company that died of old age due to lack of innovation. Founded in 1985 in Dallas, the company operated a chain of VHS movie rental stores. It adapted to the evolution of video media, moving from VHS to DVD and video games. In 2000, Blockbuster had an option to buy the young California company Netflix for \$50 million. Blockbuster's executive at the time refused the deal because Netflix was losing money. In 2014, Blockbuster Video went bankrupt while Netflix raked in more than \$5 billion in annual revenue. Netflix made all video rental companies obsolete in a few years. Blockbuster Video, in a dominant position, failed to make the paradigm shift that was needed at the time. The story was not over, as in 2019 and 2020, no less than six competing platforms came to the market with a technological and economic model similar to that of Netflix: Disney, NBC, Apple, HBO and Amazon. There is also room for "followers"; it is never too late to innovate.

1.1.2. A regime of intensive innovation

The challenge of innovation is to survive or to maintain one's advantageous position. This is not new, of course, but innovation is even more crucial today than it was yesterday because we have entered a regime of intensive innovation (Hatchuel *et al.* 2000). On a global scale, the number of patents filed and scientific publications is constantly increasing. While it took more than 60 years to go from a 17 cm vinyl to a 12 cm CD, it took only 5 years to go from a digital music player to a subscription-based streaming service. This example illustrates the accelerating pace of innovation. MPO, the European leader in vinyl records, became the European leader in CDs and then DVDs after a successful technological transition. Moreover, the reduction in the number of vinyl records on the shelves has not disrupted the expertise of companies in this field, whereas the arrival of online listening platforms has made other media obsolete. This is the second characteristic of the era of intensive innovation: innovation is increasingly radical. Not only do disruptions happen more often, but they are also more brutal. Companies are therefore more and more

subject to the risk of seeing their market disrupted and must adopt methods that allow them to transform this risk into an opportunity. Incremental innovation remains essential, but does not protect against the emergence of a disruptive competitor.

It is possible to prepare oneself to face this obligation of innovation, either through methods or tools. Innovation is a way of transforming ourselves to absorb the revolutions underway; the digital revolution in the broadest sense (including artificial intelligence, immersive technologies, supercomputers, etc.) is the one we are currently dealing with. It is also a way to adapt to the new constraints linked to the consideration of ecological issues, with a set of opportunities to be seized.

The impact of innovation as a process is considerable in the long run, but innovations as an outcome of the process are often small, incremental steps. We only hear the stories of very dramatic innovation, but most innovations are not. They are not original, nor technically complex, and often look like common sense in hindsight.

1.1.3. From creativity to innovation

Creativity differs from innovation in that the former is about coming up with ideas and the latter is about implementing them. Creativity is therefore a psychological trait and process, whereas innovation is a management issue, a professional activity that is generally collective. Indeed, the implementation of ideas often requires the association of several forms of expertise in an innovation team. When the organization allows it, creativity will generate a flow of new ideas that will feed the innovation process. If innovation is a question of survival, it is also an exciting playground with flexible rules, allowing each step forward to transform ideas into successes. The challenge is to ensure that new ideas can survive in mature companies, that is, with an optimized organization for production and continuous improvement but whose rigidity sometimes blocks any possibility of radical innovation (Lecossier *et al.* 2018). As a result, mature companies need to redesign their innovation process to protect truly innovative ideas as they mature. A survey by the Product