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**Journal of Open Innovation:
Technology, Market, and Complexity**

Business, Open Innovation and Art

Edited by

BeiBei Song and Piero Formica

Printed Edition of the Special Issue Published in
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Business, Open Innovation and Art

Business, Open Innovation and Art

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About the Special Issue Editors

BeiBei Song is the founder of Essinova, an interdisciplinary creativity and innovation academy, with 20+ years of prior corporate and entrepreneurial experience in technology, healthcare, sustainability, financial services, media and higher education, in the U.S., China and Europe. She is also an executive educator contracted with Stanford University Graduate School of Business, a guest lecturer at The Wharton School Executive Education, and a certified NeuroLeadership coach.

Throughout her multi-faceted career, Ms. Song has arbitrated international business disputes, developed strategic partnerships with technology, financial services and life science companies, and managed clinical trial contracts for cardiovascular medical devices. Spearheading media campaigns for America's Cup, she dramatically boosted brand awareness in China for the premier international sailing race.

As host and producer, Ms. Song was widely recognized for "Essinova—Innovation for the Wellbeing of Humanity", a media platform providing thought-leadership, insights and trends on health and environmental innovation. That journey led to the discovery of art as a transcending force, and the realization of the power of human mind as complementary to technological solutions. She then launched and curated Essinova—Art+Science, an online gallery featuring the intersection of art, science, culture and technology. She is now a leading champion of interdisciplinary development and a forward-thinking creative catalyst, leveraging art thinking, neuroscience, creative leadership and Renaissance learning, to drive innovation and transform individuals and organizations.

BeiBei Song holds an MBA from Stanford University and a BEcon from the University of International Business and Economics in Beijing. A popular speaker on creativity and innovation, she was honored as a Mandarin Leader, an award recognizing excellence in North America's Chinese community, highlighting exceptionally creative or philanthropic leaders. She is an Argentine tango and contemporary dancer, among other artistic dabbings.

Piero Formica began his career as an economist at the OECD's Economic Prospects Division in Paris.

Founder of the International Entrepreneurship Academy, he was a professor of economics, with a particular focus on innovation and entrepreneurship, at the Jönköping International Business School, Jönköping University, in Sweden. From 2010, he has been a Senior Research Fellow of the Innovational Value Institute at Maynooth University in Ireland. At the business school ESAM in Paris and at the C_LAB in Veneto, born out of the collaboration between the Universities of Padua and Verona (C_LAB is a multidisciplinary laboratory for the development of innovation projects between the universities and businesses), Piero Formica, in the role of professor and mentor, conducts experiments for the development of innovative projects by students who attend the lab.

He received The Innovation Luminary Award in June 2017 from the Open Innovation Science and Policy Group under the aegis of the European Union, for his work on modern innovation policy.

Professor Formica serves on the Editorial Boards of Industry and Higher Education; the International Journal of the Knowledge Economy; the International Journal of Social Ecology and Sustainable Development; the Journal of Global Entrepreneurship Research; the South Asian Journal of Management; and Frontiers in Education. He currently writes for the digital edition of the Harvard Business Review. He has published extensively in the fields of knowledge economics, entrepreneurship and innovation. His most recent published works include 'The Experimental Nature of New Venture Creation: Capitalizing on Open Innovation 2.0', Springer, 2013; 'Stories

of Innovation for the Millennial Generation: The Lynceus Long View', Palgrave Macmillan, 2013; 'The Role of Creative Ignorance: Portraits of Path Finders and Path Creators', Palgrave Macmillan, 2015; 'Grand Transformation Towards an Entrepreneurial Economy: Exploring the Void', Emerald Group Publishing, 2015; 'Entrepreneurial Renaissance: Cities Striving Towards an Era of Renaissance and Revival', Springer, 2017; 'Exploring the Culture of Open Innovation: Towards an Altruistic Model of Economy', Emerald Publishing Group, 2018; Innovation and the Arts: The Value of Humanities Studies for Business', Emerald Publishing Group, 2020; and 'ECONAISSANCE. The Reimagined School and the Culture of Entrepreneurialism. Emerald, August 2020.

Preface to “Business, Open Innovation and Art”

For much of human history, artistry and craftsmanship were natural ingredients in product-making and commerce. The Industrial Age, taken over by machines and assembly lines, squeezed cultural values and uniqueness out of many products, in favor of uniformity, volume and speed, to minimize costs and maximize profits. While industrialization improved the human condition in many ways, this “dehydration” in business has been pervasive—humans were used simply as machines to enable mass production; corporate offices were places for making a living but not living a life; and 20th century management was all about efficiency, the bottom-line, and shareholder value (with an obsession about quarterly earnings). Art went its own way, with artists either starving or celebrated in museums and auction houses away from everyday life, or some precarious point in between. This bifurcation led to antipathy between the two worlds, which is taken for granted in modern society. Artists view businesspeople as philistines, and businesspeople cannot see much use of art in corporate life beyond decoration in the lobby, and maybe some branding value, even though some may patronize art after making their fortune.

In spite of such unquestioned but unnatural perceptions, business has much to learn from the arts, and management is more of an art than people recognize. Successful artists and executives share common prerequisites. Business can grow artistically by the alchemy of invention, especially in the “innovation economy”. A notion introduced by Joseph Schumpeter in 1942, which became a mainstream concept around the turn of this century, the innovation economy is commonly seen as driven by technological developments, when in fact, human factors are of paramount importance. Technology, by itself, creates as many problems as it solves. Without a conducive culture, innovation falters or does not occur at all.

Ironically, after its predecessors turned people and organizations, into machines, the Fourth Industrial Revolution is attempting to turn machines into humans—but unlike machines in the 18th through 20th century, digital machines of today and tomorrow not only have more and more biological and cognitive properties embedded in them, they make things the way an artist and craftsman would. This is not only resurrecting the Renaissance Man, but also reuniting art and business, without frenzied corporate executives and “disruptors” realizing it. In the meantime, the destructive consequences of extractive capitalism for the environment, the hazardous effects of mass consumption destroying natural habitats and breeding novel pathogens, and anger over structural inequity in our society all came to the fore, laid bare in worldwide calamities and social turmoil marking entry into the third decade of the 21st century.

As companies find the business environment increasingly complex to navigate, the whitewater of changes and crises perpetually rocking the boat, art can be a powerful tool to catalyze innovation and transformation, helping companies (re)discover their compass, create new rafts to conquer the rapids, and find “blue ocean” market spaces in a reborn world.

The “Business, Open Innovation and Art” Special Issue was initiated to pursue research and case studies that demonstrate the value of art in business management, particularly in the realm of innovation. We welcomed insights and data that addressed the frequently asked skeptic’s question: “What is the ROI of an art program?” We sought out views on the difference between art and design, and any art thinking framework which might take the popular design thinking approach a step further. Insights from creative industries that have broader application to the business world were embraced as well.

We were delighted to receive quality contributions from educators, researchers, practitioners and entrepreneurial leaders around the world, who addressed these questions and much more. The articles that we published in the MDPI journal *Open Innovation: Technology, Market, and Complexity* are now in this book, and highlight various forms of art practice—visual, performing, conceptual, installation and music—and apply them to diverse activities and industries—higher education, healthcare, sustainability, social innovation, arts and culture, and entrepreneurship—in academic, corporate and non-profit settings, as well as in innovation ecosystems. The authors, selected for their expertise in both art and management, investigated and reported on the connections between the two, through various formats of intervention, such as arts-based learning, art hacking, and artist-in-residence, manifesting various effects on organizational life, such as artistic strategies and processes, artful leadership, management aesthetics and art thinking innovation, as depicted in Figure 1. The many functions of art relevant to the business enterprise, and their effects on individuals and systems, are loosely abstracted in Figure 2.

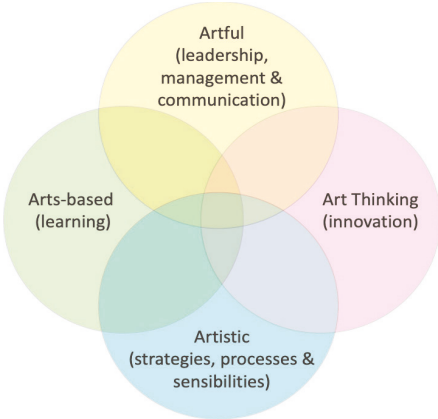


Figure 1. Interventions and manifestations of art in business.

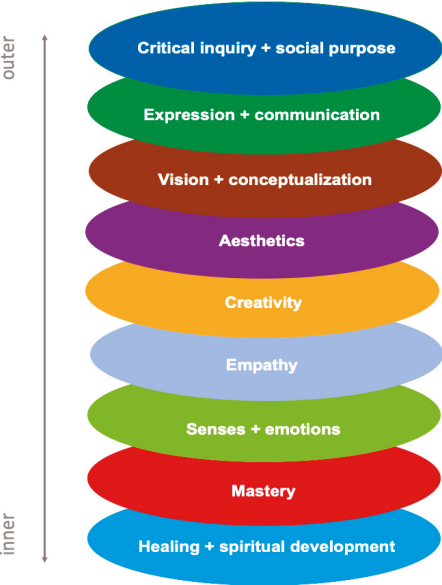


Figure 2. Multi-layered functions of art.

More specifically, the articles feature the following major themes, addressing art's value in business and innovation:

1. Creativity and Other Skills Needed for 21st-Century Work, Inadequately Trained in Conventional Business Schools

- Recognizing similarities between the cognitive process used by classical guitarists, innovative managers and entrepreneurs, Jonathan Gangi exposes a promising link between musical creativity and non-musical problem-solving [1].
- Sogol Homayoun and Danah Henriksen's literature review reveals that the positive relationship between creative personal identity and creativity at work is "stronger when individuals have opportunities to engage in non-work experiences—such as arts-based activities—and apply these toward solving work-related problems" [2].
- An interdisciplinary class at the University of California, Berkeley created by Sara Beckman, Stacy Jo Scott, and Lisa Wymore at the intersection of theatre, art and business explores both collaboration and innovation, and demonstrates how such integration "opens unexpected potential for student development as future contributors to society" [3]. The transformational experiences students go through in the course help them develop spatial thinking, abstract reasoning, and active listening and observation skills, as well as creative imagination and critical discourse. The course impact confirms earlier research findings [4–7] that literacy in the arts prepares students to negotiate cultural differences, challenge existing paradigms and navigate contradictory data; and that working collaboratively within a collected intelligence enables them to find solutions that are not only technically superior, but also ethically and culturally evaluated. Embedding liberal art content in a business course enhances students' ability "to understand undefined outcomes while allowing for failure and risk taking" [3].

2. Interdisciplinary Development, Organizational Learning and Cultural Change

The effects of arts-based initiatives (ABIs) exist far beyond academic education, in a real-world organizational environment, as evidenced by two decades of research, according to Claudia Schnugg and BeiBei Song's article on art–science collaboration. With a brief historical background on ABIs and summarizing their effects in general, Schnugg and Song closely examine one specific approach—artist residency programs, typically taking place in research, development, and science settings, and gaining popularity among government, corporate and scientific organizations alike—as an ideal means to foster interdisciplinary collaboration for innovation and to tackle complex challenges confronting society and business [8]. The article, which dissects 58 interviews with artists, scientists, engineers, managers and curators involved in 18 different programs at academic, scientific, corporate and cultural organizations, explores the multi-faceted contributions of art–science collaboration. The benefits of such interdisciplinary development are many:

- New perspectives and insights
- Personal and interpersonal learning
- Leadership development
- Future vision
- Innovation process
- Cultural transformation
- Liminality and rites of passage helping staff to cope with and navigate change

- Contextualization, communication and exchange with the next generation and society at large

All of these play a vital role in cultivating a new generation of leaders [8].

Although ABIs in the context of modern management are relatively new, there are many examples of art-driven interdisciplinary learning and creation in human history. There was of course the Renaissance, when such integration was the norm. Among other historical cases cited by Schnugg and Song is Joseph Beuys' art-driven social transformation, the focus of a study by Fabio Maria Montagnino. Beuys' Social Sculpture concept intertwines "the artistic process with social, economic, political, and environmental criticism" to trigger "a collective transition and shape society". The multidisciplinary "from chaos to order" approach taken by Beuys' 100 Days of Free International University enabled discussions that were otherwise impossible in a world of rigidly separated specializations. The idea of "shaping" the change presently permeates the open social innovation arena, where a "new organizational model is characterized by a porous structure, with a knowledge absorptive capacity and the systematic involvement of multiple stakeholders" [9].

3. Artistic Strategies and Processes for Differentiated Product Development and Creative Problem Solving

Among the value that art-science collaboration brings to innovation are complementary thinking processes and visionary approaches to product development, as exemplified by the revived and re-designed E.A.T. (Experiments in Art and Technology) Program at Nokia Bell Labs, featured in Schnugg and Song's article. Similarly, highlighting the famous E.A.T. and PAIR (Xerox PARC Artist-in-Residence), as well as residency programs at Kohler, Bosch and Microsoft, as frames of reference, Berit Sandberg takes a deeper examination of artistic strategies and work attitude, through an intervention format coined by the author as art hacking, aimed at "collective idea generation and the development of solutions for complex, possibly socially constructed business problems afflicted with uncertainty, which, from a management point of view, cannot simply be solved with common economic tools" [10]. Sandberg's experiments corroborate and add to similar findings in numerous existing literature [11–15] that:

- the artistic process explores unknown paths, radically changing directions if necessary, making detours, abandoning failure and starting anew;
- artistic attitudes expose different interpretations of reality and facilitate sensemaking; and
- artistic methods differ from rational, systematic management procedures by mindfulness, intuition and authenticity.

As a result, artists are able to master ambiguous, uncertain situations with uninhibited inspiration, unconstrained by rules and limits, and finding solutions in non-linear explorations and on creative roundabout routes.

4. Art Thinking, Strong Inner Self and Radical Innovation

The concept of art hacking espouses the view that "art is not about solving problems but 'finding solutions for questions yet unknown'" [10]. Therein lies a distinction between the popular innovation framework of design thinking and the emerging approach of art thinking, elucidated in more depth by Peter Robbins. In his article, Robbins performs a comprehensive literature review and theoretical analyses of both concepts, put in practice in a revelatory case study of an organization facing an existential crisis. The author shows how design thinking, with its inherent user-centric approach, tends to anchor solutions in a more prosaic and incremental territory; whereas art thinking, by asking

new questions, spending more time in the open-ended problem space, staking out bold new possibilities and looking for uncontested space, can lead to more penetrating insights about the future. This, in turn, can create more radical breakthroughs beyond existing markets [16], anticipating the needs of future stakeholders [8].

A framework that Beckman, Scott, and Wymore use in their “Collaborative Innovation” course—the “Inner-Other-Outer” modes of attention—can be helpful in understanding the distinction between design thinking and art thinking as well. The framework posits that successful leaders employ three types of focus:

- Inner focus (on internal physiological signals, personal aspirations, contemplation of callings, deep exploration and discovery of the self, and emotional resilience, despite setbacks and distractions), which is best represented by the artist way.
- Other focus (on developing cognitive and emotional empathy for others and social sensitivity to identify what others need), which sets the foundation for design thinking.
- Outer focus (on understanding complex systems and institutions, often providing context for inner and other, and facilitating the discovery of unexpected connections), which roughly corresponds to systems thinking.

Along with co-author Céline Verchère, Jeanne Bloch sheds light on the inner self and its dance with other and outer, in their article reflecting on a qualitative experimentation derived from her own art-tech installation that explores climate change mitigation. “The artist who connects sensory experience during creation including technological developments helps the audience connect to their sensory and emotional spheres while interacting with the artwork”. Such a connection allows both the creator and the users to experience “often hidden or unspoken issues and to question the meaning of innovations. It opens up a space for dialogue and advances user’s environmental consciousness as well as contributing to implementing innovation that transcends the idea of market need and seeks to connect to global needs that integrate human and nature” [17].

Quoting German philosopher Ernst Bloch, Bloch and Verchère speak of the “anticipative consciousness”, which the creative and imaginative inner self contributes to and converts into actions with energy. Such “anticipative consciousness” was exemplified by Joseph Beuys’ art, which anticipated an open, participated, and non-exploitative development approach, founded upon a holistic vision of society and nature. This creative approach became “the essential kernel of today’s Open Social Innovation paradigm”, and “is now prevailing as the mainstream model to shape innovation, not only in the business landscape but also in the social and environmental domains” [9]. These open social innovation features anticipated by Beuys’ artwork “rely upon collaborative organizational structures and behaviors, but ‘revolutionary’ individuals—the ‘social entrepreneurs’—are usually pivoting the change, catalyzing the available energies around the transitional actions”, and engaging individuals around a core set of values.

5. Leadership as Art

Sandberg found unexpected leadership qualities among the artists engaged in art hacking experiments. “Usually it was the artists who set impulses that allowed for progress”.

They demonstrated aesthetic skills, took the initiative with fluency, encouraged lateral thinking by coming up with original ideas and led the process while stimulating a change of perspective

by profound questions.[...] their perseverance in crisis situations pulled the others along [...] cautiously and persistently guiding their fellow players through the process by being role models in creative behaviour without reclaiming a special status within the group, acting out an integrative form of creative leadership instead.

As “cautious actors”, they carefully shepherded the group’s work process. “However, their strong presence and constructive behaviour made them secret leaders. [...] The others perceived them as of equal rank while simultaneously being in a subtle leadership role” [10]. This speaks to an artful dimension of leadership, that incorporates tacit knowledge, physical presence and influence by inspiring interaction, complementing intellectual and analytical skills. This is consistent with Schnugg and Song’s research findings of ABIs in general, and of art–science collaboration in particular, highlighting the catalytic role that art and artists play. Artist-leaders can open up new perspectives, imbue organizational aesthetics, and improve cognition. They heighten the organization’s capacity for complexity, ambiguity, contradiction and uncertainty [8].

6. Higher Purpose, Humanistic Values, and Sense of Meaning for Work and in Product

The notion of aesthetics goes far beyond style and sensory pleasures, reaching deep into the human psyche. It elevates the mind, affects beliefs, represents our values and defines our actions through life. In the same vein, the integration of the artist way into management has impact beyond strategies, processes and skills training. Art thrusts a human-centered perspective on technology and business. For example, the artists’ ability to bring the “human component” into the development of technology is credited as E.A.T. program’s essential contribution to Nokia Bell Labs. Consumers today expect not just utility from their purchases, but also identity and alignment with their personal values. “Products and experiences that evoke wonder, joy, hope, and happiness, or help personal expression, can connect with consumers on a deeper level and command a premium” [8]. Artful exploration and aesthetic design are crucial to satisfy these needs. The needs for positive emotion and value alignment are also exhibited in the workforce, where employees and students want to engage in work that is innately human, meaningful, productive, and creatively fulfilling [2]. Furthermore, many consumers and younger-generation employees are keenly aware of the challenges the world faces, from environmental damage to rampant inequality, caused in part by corporate greed and catastrophic externalities. They demand greater accountability from the business world. There is a growing movement of entrepreneurs and intellectuals advocating for quadruple bottom line, adding purpose to the progressive triple bottom line of people, profit and planet [18,19]. This fourth organizational goal benefits the cultural and spiritual wellbeing of employees, customers and communities, in harmony with the environment. These frameworks help map the return on ABI investments, to broader bottom-line evaluations than narrow, near-term financial measures. Art has a unique role to play across all these value domains, but is probably the most prevalent in the fourth bottom line [8]. Art, in its essence, is an exploration of the human condition. As digital machines acquire more and more human-like cognitive intelligence, the profound question posed by art about what it is to be human will be ever more vital, for society and business alike.

Together, this collection of outstanding articles reflects a New Renaissance movement towards the re-convergence of knowledge, a revival of humanness in the age of artificial intelligence and harmony between man and nature. The research, case studies and experiments demonstrate a rich, multidimensional relationship between art and business, be it artistic strategies and processes, artful

leadership, or art thinking for radical innovation. Clearly, art is not just a beneficiary of corporate philanthropy. On a societal level, art is an active economic driver and an agent of change towards a more sustainable and equitable economy. For individual firms, art can be a strategic asset for innovation, a cultivator of a more creative, resourceful and passionate workforce, and an impactful investment in their ability to navigate complexity and transform.

On a personal note, this Special Issue project has been an intensely gratifying experience for me. I was honored to have Professor Piero Formica and Dr. Claus Springborg join me in it. I am also grateful for the generous support from JOItmC editorial leadership and staff throughout the process. Integrating business and art is taking on more urgency today as the world undergoes the crucible of transformation, calling for fundamental changes in the way humans learn, create, and interrelate. This presents unprecedented challenges, as well as unprecedented opportunities. We are grateful for the intellectual and spiritual contributions authors have made to this project and we look forward to future collaborations in advancing the fundamental role of art and humanities, together with science and economy, in this crucial phase of human history.

BeiBei Song
Special Issue Editor

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Article

Classical Guitar Study as Creativity Training: Potential Benefits for Managers and Entrepreneurs

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Abstract: Divergent thinking ability, as an aspect of creativity, seems valuable to managers and entrepreneurs as they employ the tools of creative problem-solving and innovative thinking in pursuit of business success. Musical study in general, and classical guitar study to a greater degree, has the potential to improve divergent thinking and creative problem-solving abilities. As such, I suggest that utilizing classical guitar study as a creativity training tool may benefit entrepreneurs and managers within a variety of industries.

Keywords: classical guitar study; divergent thinking; creativity training; creative problem-solving; innovation; entrepreneurship; management

1. Introduction

The arts provide many benefits to humanity, such as the physical use of the hands and body and using the whole mind, among many others, and are sources of alternate ways to learn and solve problems [1]. This is not to say the arts are the only disciplines providing these types of benefits, but rather they engage the mind and body in specific ways that may not be readily observable to those lacking a deep knowledge of a particular art form. Classical guitar study, if approached in a particular way, has the potential to foster creative thinking, thus any person interested in classical guitar study may become more creative by engaging with this method. In this conceptual paper, I urge managers and entrepreneurs to consider the long-term benefits of classical guitar study, as it may help them to think more creatively in their work environments. There are many ways to develop creative thinking, of course, and I am not suggesting that classical guitar study is the only way, or the best way. Many managers and entrepreneurs may not find music or guitar appealing as an area of study or long-term hobby. I am simply illustrating, for those that find it attractive, how a particular approach to classical guitar study presents a rich environment for creativity training.

Entrepreneurs and managers need creativity to be successful in the tasks of creating, communicating, and exchanging value with a variety of stakeholders, suppliers, distributors, and customers. Some scholars believe that entrepreneurship involves creating and exchanging forms of value [2–4]. I agree with this characterization of what entrepreneurs do, and for this article entrepreneurship refers to creating and exchanging value. For this exchange to take place, communicating value must take place as well. Managers can also do these same activities. When I refer to managers, I mean those in positions that require making executive decisions. I view managers and entrepreneurs as leaders who make executive decisions and work in problem-spaces of uncertainty, although entrepreneurs deal with uncertainty more so than managers [5]. Nevertheless, managers and entrepreneurs deal with, to varying degrees, bearing uncertainty, seeking profit in a variety of forms, and making ultimate decisions [6]. They are part of the super-creative core, the type of knowledge-worker that must determine their own tasks and the tasks of others [7]. As such, creativity is crucial to their daily tasks, their own success and that of their employees and organizations [8].

Innovation pertains to creating novelty in a variety of forms that is useful in some manner [9]. Innovation is the tool of entrepreneurs, and certainly involves creativity throughout the process [10]. Managers who implement innovative new products, services and initiatives within an existing organization seem to operate in a similar fashion to entrepreneurs, and are often referred to as intrapreneurs. When something novel is introduced, by a manager or entrepreneur, the problem-space becomes one of uncertainty and unknown variables [5]. This too requires creativity on the part of executive decision-makers, as they seek to problem-solve in an innovative, or novel and useful way. Although this article is not about entrepreneurship, innovation, or management, per se, these conceptualizations and categorizations point out that managers and entrepreneurs certainly need to be creative to be successful. This article is about classical guitar training and the similarities between professional classical guitarists, managers, and entrepreneurs, as the following section explores.

2. Cognitive Function Similarities in Guitarists, Managers and Entrepreneurs

Classical guitarists may not view themselves as managers or entrepreneurs, and managers and entrepreneurs may not consider themselves to have much in common with guitarists or believe that guitar training has the potential to benefit their managerial and entrepreneurial activities. In actuality, however, these two seemingly disparate groups have similar cognitive operations. Likewise, sustained classical guitar practice may be an invaluable resource for creativity training and divergent thinking development. This section of the article reveals how professional classical guitarists act managerially and entrepreneurially. The intention is to help business professionals in non-arts fields recognize the similarities that exist between themselves and classical guitar professionals, and vice versa. Hopefully, managers and entrepreneurs of all kinds (arts and non-arts) will see the similarities, feel a sense of solidarity and camaraderie, and become motivated to begin the process of classical guitar study as an arena for creativity training and life-long enjoyment.

Successful professional classical guitarists think and behave like managers and entrepreneurs. How so? Two articles from the business literature describe five managerial mind-sets and five entrepreneurial mind-sets, as spin-off concepts based upon psychologist William Gardner's well known 'Five Minds.' I chose to cite these two particular sources because, when combined, these ten 'minds' illustrate the similarities between the cognitive functioning of successful professional guitarists, business managers, and entrepreneurs.

First, from the management literature [11], we see five perspectives of management practice:

1. Managing self: the reflective (*thinking abstractly*) mind-set;
2. Managing organizations: the analytic mindset;
3. Managing context: the worldly mind-set;
4. Managing relationships: the collaborative mind-set;
5. Managing change: the action mind-set.

Secondly, from the entrepreneurship literature come five entrepreneurial minds [12], each pertaining to cognitive skills that successful entrepreneurs possess and utilize:

1. The Opportunity Recognizing Mind: the recognition of opportunity is essential to entrepreneurship;
2. The Designing Mind: this mind defines the need to combine disparate ideas, people, or physical objects in novel ways that appeal to others;
3. The Risk Managing Mind: the ability to manage risk refers both to the ability, emotionally, to manage perceived risk and the ability to reduce actual risk through specific actions;
4. The Resilient Mind: successful entrepreneurs develop resilience only through multiple real-world failures;
5. The Effectuating Mind: this mind is about taking action in a world of uncertain and often unpredictable outcomes.

Professional guitarists think abstractly about how the instrument works, how their physiology relates to the instrument, and in making choices about how to physically play the notes and decisions about the musical expression within the interpretation of the piece. The end result of thinking abstractly is to inform practical doing as it relates to the self, the instrument, and the music. Further, reflection (*thinking abstractly*), collaboration, organization, context, and taking action are important to guitarists in their professional practice of performing and teaching.

In preparation for performing, guitarists need skill in recognizing opportunities for brilliant technical and musical choices within a piece, opportunities for playing new repertoire or collaborating with significant composers or performers, and innovative performance venue opportunities. Design is important when arranging or composing new works for guitar, as well as identifying how to physically perform the music, musical patterns, and shaping a long-term career trajectory. Guitarists must manage and mitigate risk, remain resilient, and take action in the face of uncertainty when striving to acquire and maintain professional levels of teaching, performing, arranging, and composing with the guitar.

Professional guitarists think and act like managers and entrepreneurs by making executive decisions concerning repertoire, audience engagement strategies, musical interpretation, pedagogical philosophy and style, and the entire scope of their career. As primarily solo performers, classical guitarists must operate autonomously and direct themselves, rather than relying on a leader like ensemble players who are directed by a conductor. This requires guitarists to make executive decisions regarding the allocation of resources, both technically and musically, while adapting in real time by monitoring results using feedback loops in practice and performance. Guitarists also need to create long-range plans for developing technically, musically, and pedagogically with an orientation towards their career as a whole.

Three praxeological dimensions of entrepreneurship are profit-seeking, uncertainty-bearing, and ultimate decision-making [6]. Professional guitarists seek multiple forms of profit, visible in the expectation of technical and musical profit from practicing and pecuniary profit from teaching and performing. Artists also seek profit in the form of intrinsic satisfaction from personal achievement, positively affecting others through art, and being valued by audiences and students as accomplished performers and pedagogues.

Guitarists similarly bear uncertainty as a matter of course. Traditional employment routes are challenging and require guitarists to create their own careers. Every concert requires dealing with the possibility of failing to deliver a compelling performance, potentially leading to decreased future performances. Likewise, ultimate decision-making is inherent in repertoire selection, solutions for physically performing the repertoire, student recruitment, concert bookings, and the assembly of a fiscally solvent career. These decisions are managerial and entrepreneurial in nature and require creative problem-solving and divergent thinking.

How is this relevant to managers and entrepreneurs who are not professional musicians? I am not suggesting that managers and entrepreneurs must become professional classical guitarists in order to reap the benefits of classical guitar study. I am merely providing an inside look into an artistic process, highlighting the similarities between guitarists and non-musicians and encouraging managers and entrepreneurs of all kinds to begin a life-long journey of discovery and pleasure playing the classical guitar. Through deliberate and sustained classical guitar practice, executives could develop a greater capacity for the type of creative thinking that is vital for managers and entrepreneurs as they seek to innovatively create and exchange value and effectively run organizations.

3. Divergent Thinking Defined

So, what is divergent thinking? Since the middle of the 20th century, divergent thinking has been considered a primary cognitive component of creativity [13,14]. Scholars Runco and Acar point out that:

“Divergent thinking is not the same as creative thinking. Divergent thinking often leads to originality, and originality is the central feature of creativity, but someone can do well on

a test of divergent thinking and never actually perform in a creative fashion . . . There is [however], great value in the concept of divergent thinking. Much of the research focuses on divergent thinking tests, and their reliability and validity, but additional research tells us more broadly how divergent thinking . . . is associated with problem-solving, ideation, and creative potential.” [15]

Researchers Gibson, et al. explain that:

“Divergent thinking is distinguished from convergent thinking, which is defined by a narrowing of possible responses to reach the correct solutions. In contrast, divergent thinking involves flexible ideation to generate many responses to open-ended and multifaceted problems. Convergent thinking works best with well-defined problems that have a clearly defined response, while divergent thinking is best suited for poorly defined or unstructured problems . . . Since Guilford’s seminal contribution to the study of creativity, divergent thinking has remained a conceptually, internally, and externally valid element of the creative process.” [16]

According to Guilford, divergent thinking provides the foundation for creative production because it requires ideational searching without directional boundaries [14]. He identified four aspects of divergent thinking [14,17]:

1. fluency—the ability to produce a great number of ideas or problem solutions in a short period of time;
2. flexibility—the ability to simultaneously propose a variety of approaches to a specific problem;
3. originality—the ability to produce new, original ideas; and
4. elaboration—the ability to systematize and organize the details of an idea and carry it out.

4. Research Suggests Musicians May Be Better Divergent Thinkers

Cognitive science provides compelling research supporting the assertion that guitar training may develop divergent thinking. One publication in particular details an experiment designed to test creative thinking in musicians and non-musicians. The authors summarize their work, stating:

“Performing artists are implicitly assumed to have greater creative potential than the general population...Musicians are a particularly relevant population to study because of their intensive, long-term training that may have a significant impact on neural circuits that are associated with creativity . . . Therefore, it was logical to ask if trained musicians might show increased creativity in non-musical tasks as well.” [16]

Results of the study are as follows:

“ . . . we found evidence for increased creativity in trained musicians... These results suggest that musicians have increased convergent and divergent thinking compared with non-musicians . . . It is possible that music training influences brain organization such that the resulting cognitive system is prone to divergent thinking.” [16]

This study supports my suggestion that a particular approach to classical guitar training has the potential to develop divergent thinking capacity. Although participants were musicians who played piano, strings, and woodwind instruments, it seems logical that this would also be true of classical guitarists. The particular approach to classical guitar training explained in the following section may develop incredibly high levels of divergent thinking skill due to the idiosyncrasies of the guitar. Classical guitarists have unique challenges presented to them by their instrument that musicians playing other instruments do not encounter. For example, although the piano is a complex instrument, fingering choices are simplified because each note on the musical staff can only be played in one specific location on the keyboard. This reduces the need for, and the instrumental constraints

that foster, divergent thinking skill. On the guitar, however, there are three or four string and fret location options for any given note. Thus, when compared to other musical instruments, the classical guitar may offer the most fertile ground for divergent thinking training.

5. How Classical Guitar Training May Develop Divergent Thinking Expertise

The creative decision-making process of a particular approach to classical guitar training utilizes Guilford's aspects of divergent thinking. Many guitarists do not possess adequate knowledge of the fretboard and instead rely on rote learning, resulting in difficulty recognizing fingering options and changing to a better solution. Therefore, this section presupposes that guitarists are *working towards* or possess the following prerequisites of thinking divergently with the instrument, as defined by Christopher Berg, a prominent sage of classical guitar performance, scholarship, and pedagogy:

1. an expert knowledge of the fretboard;
2. an accurate perception of personal capabilities and limitations, including distinguishing between concrete limitations versus undeveloped skills;
3. a clear idea of musical problems to be solved;
4. a sense of what fingerings work well at slow tempos, but not *at* tempo, versus a sense of what fingering *will* work at tempo; and
5. a heightened sense of the instrument's technical capabilities [18].

When guitarists learn a musical work, they must determine how to physically perform the piece, a process referred to as "fingering". Sherrod defines fingering as:

"... the exact, well-planned, and deliberate designation of fingers to a given passage. The primary consideration for any guitarist is an authentic and artistic performance of the music. The methodical and meticulous choice of fingers is of utmost importance in accomplishing this task." [19]

Both the right and left hands, as used in classical style guitar playing, require fingering choices. Regarding this, Yates states:

"[Fingering choices are impacted by the] melodic and harmonic context and the compromise between musical effect and technical expediency. [Choices are also impacted] by the physical limits of the instrument, and by the facility of the player, noting that results in performance will likely reflect the intentions of the player as much as the implications of the fingerings themselves." [20]

The task of creating effective fingering solutions on the guitar, as highlighted by these authors, necessitates implementing each aspect of divergent thinking (fluency, flexibility, originality, elaboration) to navigate successfully through complex musical textures. For example, the guitarist is required to be *fluent*, or produce a great number of ideas or problem solutions in a short amount of time when learning a new piece of music. The problems presented involve musical issues, such as melodic and harmonic context and musical effect, as well as technical (i.e., what is required of the fingers physically).

During this time of *fluency*, the guitarist also must demonstrate *flexibility*, by generating a variety of fingering choices for the specific problem area. This includes being *original* with ways of playing the passage, because often the fingerings included in the score are the solutions that worked best for a specific individual, and are typically intended as suggestions. Finally, the guitarist must be able to *elaborate*, or organize and systematize the fingering ideas and solutions, and physically test each to determine which solution best satisfies both the technical and aesthetic demands of the work. Recombination, the activity of taking fragments of different ideas and combining them to produce a brilliant and unexpected result, is another important skill to use during the *elaboration* process [18].

A guitarist’s need for high levels of divergent thinking is revealed by examining how the fretboard works. For example, many notes can be played on four different frets and strings, despite the fact that they are the same pitch and are identically notated. The note E, in the top space of the treble clef, could be played on the open first string, or the fifth fret of the second string, or the ninth fret of the third string, or the fourteenth fret of the fourth string. The choice depends on the musical texture, melodic and harmonic context, musical effect, desired tone color, and right and left hand technical requirements.

The Gigue of J.S. Bach’s Lute Suite BWV 1006a provides fertile ground for enlivening the divergent thinking process. Guitarists must move cognitively through each aspect of divergent thinking when engaging with the notes of measure ten, shown in Figure 1.



Figure 1. Gigue, measure 10, of J.S. Bach’s Lute Suite BWV 1006a.

First, they must be *fluent*, or produce a great number of ideas or problem solutions, and demonstrate *flexibility*, by generating a variety of fingering choices for the specific problem area. Figures 2–8 represent seven possible combinations of strings that theoretically would produce the pitches Bach wrote in measure ten. Six of the presented options are *original* to the author, while the seventh is the suggestion of an editor [21]. Seven examples may seem excessive, but are included because they represent the full scope of possible locations to play the notes in Figure 1, and serve to emphasize my point that the guitar provides an almost overwhelming amount of possibilities, perhaps more so than other instruments. In each example the circled numbers represent the guitar string that could produce the given pitch (by left hand fingers pressing appropriate strings down to appropriate frets), and the letters represent the right hand fingers that pluck each note (*p* = thumb, *i* = index, *m* = middle, *a* = ring). These examples show how guitarists *elaborate* by systematizing the fingering solutions and physically testing each to determine which option best satisfies the technical and aesthetic demands of the music and is doable within the constraints of an individual’s unique physiology.

All of the following examples are *theoretically possible*, yet some are physically impossible. The more absurd options, *since they are physically impossible*, are Figures 2–5.

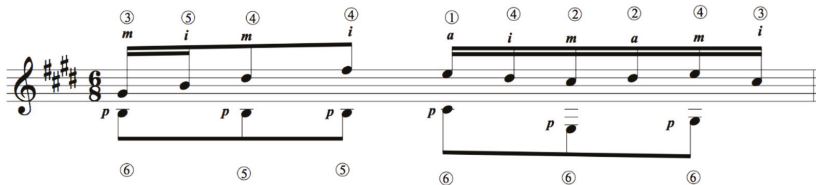


Figure 2. Physically Impossible.

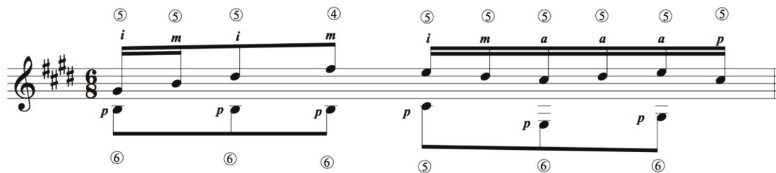


Figure 3. Physically Impossible.

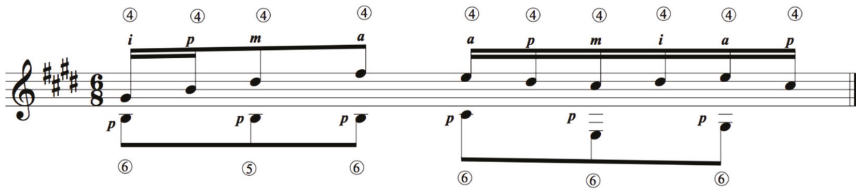


Figure 4. Physically Impossible.

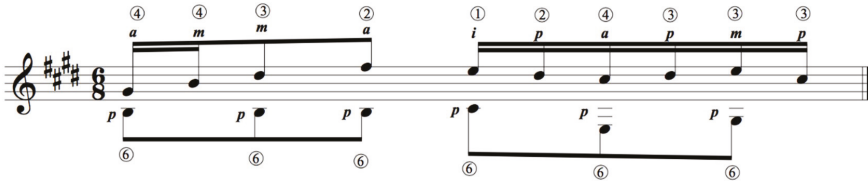


Figure 5. Physically Impossible.

Figures 6–8 are the best remaining choices. Of these, Figures 7 and 8 are better than 6, because the musical result of Figure 6 would be more detached and choppy in sound, or less connected and lyrical.

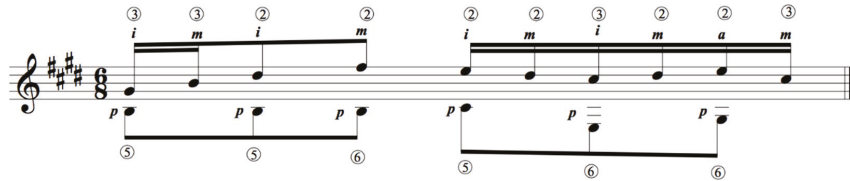


Figure 6. Viable Solution.

For the remaining examples, the choice between 7 and 8 is made by context, preference, physiology, and aesthetic taste. My preference is Figure 7, while others would perhaps choose Figure 8.

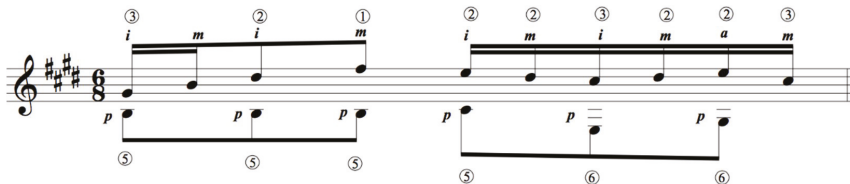


Figure 7. My Preference.

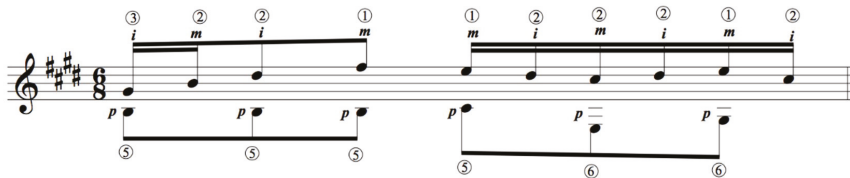


Figure 8. Good Solution.

Thus far, choices have been made based solely upon which strings to use to play the notes and illustrates how this creative decision-making process necessitates incorporating the full range of cognitive activity required to think divergently, as presented previously. Added to this, the guitarist

must make choices about which finger to use for each note on each string for each hand (the examples provided above do not include left hand fingering choices, rather they only include string choices for producing each note). The cumulative effect reveals an incredible amount of possibilities for playing *only one* measure of contrapuntal music on the guitar. Learning an entire musical work using this creative problem-solving process provides numerous opportunities for creativity training and the development of divergent thinking expertise.

6. Divergent Thinking Expertise Applied to Management & Entrepreneurship

My thesis is that classical guitarists have the potential to develop high levels of divergent thinking capacity through a particular learning process, as previously described. Simply due to the nature of their instrument, classical guitarists can develop core capacities and innate advantages for creativity and problem-solving. If this invaluable skill is applied to other domains, guitar training can be utilized as a method for creative success in other contexts, such as managerial and entrepreneurial action within the business environment. How is this skill applied? Through the sustained and deliberate practice of the techniques of expert entrepreneurs.

Innovation involves creating novel and useful combinations of means, or resources. Entrepreneurship involves creating and exchanging forms of value by interacting with a variety of stakeholders, such as partners and customers. Intrapreneurs and managers must be innovative in developing and exchanging new forms of value while maintaining and sustaining organizational success. Expert entrepreneurs continuously think about what they can do with their resources, what else they can do, and what commitments can be made with others who can provide more resources and possibilities [22].

Saras Sarasvathy's research shows us how expert entrepreneurs creatively transform resources into opportunities [22], and provides eight transformation types:

1. Deleting/supplementing—subtracting from or adding to an existing offering;
2. Composing/decomposing—reorganizing material that is already there, decomposing and recomposing it;
3. Exaptation—transforming existing artefacts by converting them to new uses;
4. Re-weighting—increasing or decreasing the emphasis of features or attributes;
5. Manipulation—inverting, mirroring, twisting, turning an idea or artefact inside out;
6. Deformation—deliberately deforming the original idea or concept, analogous to melody deformation in jazz;
7. Localization/regionalization/globalization—changing the scope of the market by proposing smaller or larger markets;
8. Ad hoc associating—drawing on prior experiences and memory by associating the current venture with some previous problem or opportunity.

The creative process of these transformation types is very similar to the creative problem-solving process used in classical guitar study. Solving fingering problems in a musical work involves deleting/supplementing by subtracting or adding to the existing fingering solutions that are typically printed in the musical score by an editor. Composing/decomposing, manipulation, deformation, and re-weighting are utilized very often as well when making choices for fingerings and musical interpretation. Even ad hoc associating is involved by drawing upon prior experience and memory of fingering solutions learned when studying previous pieces of music. Expert guitarists think about what can be done to solve fingering problems in a musical passage, and what else can be done. This is the particular manner in which the cognitive processing of classical guitarists, as described previously, is identical to innovative managers and entrepreneurs.

These transformation types are tools and techniques for creating valuable combinations of resources. Knowing the transformation types is only the beginning of successfully transforming means into valuable ideas. The challenge is developing the divergent thinking expertise that is necessary

for better results from creativity training exercises. Divergent thinking expertise seems crucial to generating creative business ideas. Business school training develops analytical and predictive skill, but not necessarily divergent thinking expertise. There are many wonderful pedagogical approaches to entrepreneurship education that provide creativity exercises, yet many students, teachers, and professionals still struggle to produce creative ideas. Sustained and deliberate classical guitar study can be a creativity training opportunity and one possible solution to the challenge of generating creative and valuable ideas.

Managers and entrepreneurs who are already creative and exhibit expert divergent thinking abilities may still benefit from classical guitar study. One research study in particular shows that preoccupation with reward reduces creativity:

“Explicitly contracting to do an activity in order to obtain a reward leads to lower levels of creativity than contracting to do the activity for no reward, or simply being presented with the task, or being presented with the task and a subsequent reward. The implications of this finding are intriguing. It may be that commissioned work will, in general, be less creative than work that is done out of pure interest. And, within an ongoing work organization or classroom setting, it may be that tying specific rewards to specific tasks chosen by workers and students will be less conducive to creativity than simply allowing choice of activities without specific pay-offs attached to each task.” [23]

If managers and entrepreneurs are too focused on the reward (i.e., financial profits, achieving the organizational mission, etc.), this may reduce their creativity when solving problems and generating ideas for products, services, initiatives, and programs. Training the brain to generate original solutions during classical guitar study could be utilized as a way to learn to be creative as an end in itself, rather than seeking a reward. Conceptually, it seems that managers and entrepreneurs could transfer this ability from classical guitar study into their professional domain. Many artists, including classical guitarists as mentioned previously, engage in their art form for the intrinsic satisfaction they derive from it, not necessarily for any particular reward, and often in spite of the knowledge that they may struggle to earn enough money to make a living. If entrepreneurs and managers learn to do the same, perhaps it will allow them to become even more creative.

7. Summary

Cognitive science research suggests that musicians may possess distinct advantages in divergent thinking tasks. Divergent thinking skill may result from utilizing a particular method of classical guitar study. Thus, anyone who is interested in creativity training and classical guitar study could develop divergent thinking expertise through long-term, focused practice. In this article I have presented conceptual evidence to support my suggestion that classical guitar study may benefit and enhance the creativity and innovative behavior of managers and entrepreneurs. A future research goal is to empirically test this hypothesis.

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Review

Creativity in Business Education: A Review of Creative Self-Belief Theories and Arts-Based Methods

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Abstract: Creativity has become one of the most sought-after skills from graduates across business and industry. It is therefore imperative to infuse creativity training within business programs of study and professional development experiences, to remind people of their eternally curious and creative nature. The objective of this paper is to explore the literature around theories of creative potential and performance—including creative identity, creative mindset, and creative self-efficacy. We consider perspectives that reveal that creativity is a mindset predicated on beliefs and ways of thinking. Educational psychology literature and theories of creative self-belief illustrate how creative identity, mindset, and self-efficacy form the core of an individual's belief system to think, act, and develop creatively in the world. This connects to the potential of arts-based methods as a means to infuse creative learning into business education. We illustrate how our findings can be put into practice by sharing an example of an arts-based intervention that is currently in progress to develop creative capacity among students in an internationally known business program. We conclude with the idea that its incumbent upon business education, professional development, and training to incorporate methodologies that enhance creative capacity by initially eliminating or minimizing self-perceived limitations in people, such as fear, negative personal judgement, and chattering of the mind—and theories of creative self-belief provide a foundation that can undergird arts-based methods toward this goal.

Keywords: creativity; business; education; training; professional development; creative thinking; theories; arts; arts-based methods; innovation

1. Introduction

There has been increasing discussion about the need for more creative thinkers in business and industry [1]. Florida [2], Schlee and Harich [3], and others have advocated the need to cultivate a creative workforce, to develop innovative thinkers that can address complex 21st century problems and challenges.

The fact that creativity is perceived as being variable, inimitable and subjective, has often made it vulnerable to being marginalized in education—since traditional educational structures are often based around certainty, grades, and single-answer thinking. Yet, creative thought processes are necessary criteria for accomplishment in our complex, interdependent society [4]. Globalization has led to exponential increases in knowledge and technology. This has implications for education—especially in business fields, which thrive on the need to innovate, problem solve, and nimbly shift with societal moves. Daniel Pink [5] illustrates the heightening value of creative abilities, stating:

Today, the defining skills of the previous era—the “left brain” capabilities that powered the Information Age—are necessary but no longer sufficient. And the capabilities we once

disdained or thought frivolous—the “right brain” qualities of inventiveness, empathy, joyfulness, and meaning—increasingly will determine who flourishes and who flounders. (p. 3)

Given the popularity of business education as a field of study, and the need for creative thinking in the business workforce, it is important to consider the intersection of creativity and business education. Boulocher-Passet et al. [6] encourage initiatives for creativity in business schools, and specifically note that there are few existing studies that teach creativity to business students with the aim of leveraging student perception on creativity. There are many good reasons to support the promotion of creative thinking in business contexts or training, and the rationale for this has been established by existing literature, organized around the ways that creativity addresses problems and sustains economic development [7–9], supports human wellness and expression [10,11], and builds productive confidence [12,13]. In this article, we focus on this issue of creativity in business education in a literature review around theories of creative self-beliefs and the potential of arts-based methods in business.

The objective of this paper is to explore and review key literature around theories of creative potential and performance—which includes creative identity, creative mindset, and creative self-efficacy. We begin by defining what we mean by creativity. Plucker et al. [14] note that one of the common weaknesses of creativity research and scholarship has been a problem of lack of definition, with only 38% of articles about creativity in academic journals even providing any working definition at all. Thus, we seek to ground our ideas in a common perspective on the construct. We build upon theories from education and psychology which discuss the importance of supporting creative capacity. We relate these ideas to creative self-beliefs—including creative mindset, creative identity, and creative self-efficacy. Further, we focus on the use of arts-based methods in business education and training as being one of several important approaches to building creative confidence and capacities. We provide some current and future directions for research in this area, and describe an in-progress research intervention, as an example of an approach that seeks to enhance creative capacity (through arts-based and other methods) among international business program students.

2. Defining and Grounding Creativity as a Construct

Creativity is an ancient construct, yet formal research on the concept has only been prevalent since the latter half of the 20th century [15]. While creativity is thought of as a subjective term, most research around it defines it as having several core components. First, a creative idea, process or product is novel—it brings something into play that either did not exist before or, at least, is relatively new for its context. Cropley [16] asserts, however, that a novel idea with no potential use cannot be taken as “creative”, because novelty does not guarantee that something will be effective [17,18]. So, the most common definition suggests that creativity is a process of coming up with designs, artifacts, objects, programs, or ideas that are both “novel” (original, new, fresh, etc.) and “effective” (useful, productive, or of some value to others). Another key characteristic, according to Sternberg and O’Hara [19], involves “task appropriateness.” Creative things (ideas, products, processes, artifacts, experiences, etc.) are sensitive to the context and domain they are created within. Mishra and Koehler [20] term this third construct as ‘wholeness’—involving the contextual aspects of creative work, or how well it is fit to that work’s specific purpose or context. From both a business and an educational perspective, in these constructs of novelty, effectiveness, and wholeness (NEW), creativity fits well with the goals of effective learning and improvement [21].

The problem of creating learning experiences that are novel (or relatively so, in an instantiation of a course), effective, and whole in business education, is that the variety of business contexts we may be teaching for are subject to variability and change.

Thus, we may not always fully understand what the goals, settings, outcomes, or challenges look like—in order to try to teach students to readily produce creativity in novel, effective, and whole products or ways of doing things. It may be more constructive to aim for supporting the development of a creative orientation to the world. In evolving contexts, things change frequently, and we are often

dealing with uncertainty and unknowns. This is why we suggest that creativity be instead defined by a focus on a mindset that corresponds with creative thinking, rather than chasing a moving target of novelty, effectiveness, and wholeness, or seeking perfect creativity. If we start by understanding and aiming for the habits of mind or theoretical components that help support creative development across the lifespan, we are better positioned to produce creative thinkers across the wide range of contexts for business education.

We suggest that there is much of value in theories of creative self-belief. This is a broad construct describing an individual's beliefs about their own creativity. Theories under this construct help to explain how the essential predictors of whether individuals are able to think, act, and work creatively depends on their own beliefs about themselves as a creative individual [22]. Beghetto and Karwowski [23] suggest that individuals must feel efficacious or see themselves as creative to actually engage creatively. In management literature, there are few studies that focus on how one's beliefs, attitudes, and expectations about creativity might be adjusted to maximize creative performance—so much of the extant literature lies in education or psychology.

Additionally, in grounding ourselves in a creativity worldview, and in defining creativity, we consider certain areas of focus or perspective. In the report *All Our Futures* by the British National Advisory Committee on Creative and Culture Education [24], Sir Ken Robinson and colleagues introduced three perspectives on creativity. In one, they suggest, “many people associate creativity primarily with the arts . . . but creativity is not unique to the arts. It is equally fundamental to advances in the sciences, in mathematics, technology, in politics, business and in all areas of everyday life” [24] (p. 27). Another type of creativity focuses on how people with exceptional creative gifts produce historic theories, inventions, paintings, or compositions—although such creativity is less common. Finally, there is a more democratic definition of creativity that encompasses more people, which is the process of “imaginative activity fashioned so as to produce outcomes that are both original and of value” [24] (p. 30). According to this democratic definition, which most contemporary creativity scholars support [15], all people can be creative in their work and daily life, even if they do not recognize they are being creative. This perspective on creativity is also essential to education, because without it, it is hard to envision building educative experiences that allow people to develop creatively.

In management literature, creativity is not always well defined, but business professor Teresa Amabile's definition is often cited, which suggests that creativity is “the production of novel and appropriate solutions to open-ended problems in any domain of human activity” [25] (p. 18). This definition and most applications in the field of business lean toward a democratic perspective, which suggests that creativity can, and should, be developed by everyone, and acted on as a vital driver for innovation [26].

Thus, we assert that a more democratic perspective on creativity—paired with an aim to support learners in their own beliefs and capacity to act in novel, effective, and whole ways—can be informed by theories of creative self-belief. These theories include creative identity, creative mindset, and creative self-efficacy. In order to better understand the components of creative self-belief, we review several theoretical constructs from educational psychology which we believe may be useful to consider in business education and training. In the following sections, we will delve more deeply into these theories that fall under the heading of creative self-belief.

3. Guiding Approach to the Literature

In organizing our approach to this review of the literature, we sought to understand common themes and core ideas about creative self-beliefs. We consider: how are creative self-beliefs defined in the literature? More specifically, we consider this question with an eye toward what elements of creative self-beliefs may relate to, or inform, arts-based creativity training.

The notion of self-beliefs is a general construct in psychology that describes individuals' beliefs about themselves, in terms of who they are and where their capacities lie. Research on self-beliefs falls under several theory-driven psychological constructs, including: identity theory [27,28], growth

mindset theory [29], and self-efficacy theory [30]. These three theories, though all recent in the history of educational psychology, are each significant explanatory concepts on self-beliefs. Because they are meta-theories, they often function as parent concepts, which have smaller unique branches and niche areas of theory offshoots. Of interest to us and our question are three narrower niche areas of research, looking at how identity, mindset, and self-efficacy intersect with creativity.

In order to examine this, we begin each literature section with a brief overview of the ‘parent’ theory. We sought to summarize the key points of each parent theory based on primary sources. The aim here is to give the reader a brief overview of the landscape of each theory construct, followed by a more detailed look at the creativity-focused branch of that theory. Each parent theory is too broad to be reviewed in a single article. However, more specific areas of intersection with creativity are narrower, as well as more recent and niche, making it possible to examine them in enough depth to understand the basic scope.

We engaged a search of each theoretical branch of creative self-beliefs. Our sources of literature were two given databases, (1) ScienceDirect and (2) Scopus, as these comprise a significant swath of ‘mainstream’ research papers in English [31].

Tranfield et al. [32] suggest that a methodical search begins with the identification of keywords and search terms, as chosen from the scoping study and the literature, and discussions noted within the review team. The reviewer(s) then choose the search strings that are most appropriate for the study. In this sense, we were able to keep the search relatively straightforward, by using keywords and terms that precisely defined each area, including each of the terms themselves: “creative identity”, “creative mindset”, and “creative self-efficacy”. This yielded articles or studies that specifically referenced the exact theory/terminology within the text. We determined this to be a more appropriate approach for these particular areas than the more expansive Boolean search terms of creativity and identity, creativity and mindset, and creativity and self-efficacy.

We began the initial scoping search with these expanded terms, and found that these produce large volumes of works outside of the scope of each specific theory. For example, the literature search data we display below in Table 1 illustrates the numbers yielded by using the specific theory terms themselves (e.g., “creative mindset”), vs more expanded search (e.g., creativity and mindset).

Table 1. Numbers for specific theory terms.

	Creative Mindset	Creativity and Mindset	Creative Identity	Creativity and Identity	Creative Self-Efficacy	Creativity and Self-Efficacy
Scopus	33	241	82	1960	185	384
Science Direct	62	3112	67	16,626	185	6620

While the more open Boolean search, which did not specify the theory terminology in “quotes”, produced greatly more results in terms of pure numbers, it also produced a vast array of unrelated literature that merely contained those terms in the text. By narrowing down to the proper theory terminology, we were able to identify the relevant works on the topic. Thus, our initial list of potential works was drawn from this. Even within those smaller search scopes of exact theory terminology, there were still significant numbers of articles that were not appropriate for inclusion in our discussion that follows.

Thus, our extended search criteria were narrowed to identify only articles that placed these creative self-belief theories as a focus of study, or a core topic. We aimed to look beyond any articles that simply mentioned the terms within the text, or that dealt with them in peripheral ways that offered little in takeaways (e.g., an article that referred to or mentioned “creative identity” would not be included unless it sought to either empirically study the theory, or discuss the concept with some theoretical focus). We were able to narrow our focus to the key articles described in our narrative

review, as many articles that popped up in our keyword search simply mentioned these terms in the text, but focused on other topics.

As we examined each initial search to select out articles that put the construct or concept as a central point or area of study, we identified a more selected swath of research in each area. This makes sense, as each of these creative self-belief concepts has emerged primarily within recent decades, and is a small, but promising, area in the larger arena of creativity research. Thus, each made for a small-scope, but interesting, look at issues of creative self-beliefs. These articles are reported below in each section, which is a more of a narrative than purely systematic type of review, which we explain further.

Limitations

There are some notable limitations in this work. First, we limited our examination to two core databases. Although these are comprehensive sources of academic scholarship in English, and encompass most major and smaller journals that cover creativity research and scholarship, it remains a potential limitation of scope and size.

Further, our own personal biases as educational researchers could have limited us in scoping each of the search terms, as researchers naturally bring in their own preconceptions, assumptions, or interests that may lead to a potential tendency to seek confirming evidence of each theory or area of interest [33].

Most importantly, while we have aimed to systematize and explain our search processes and provide the reader with more clarity on the process and rationale for the review, this review is not a full systematic literature review. We do not aim to present each body of literature as a kind of “data” set for empirical dissection, as the literature on this topic is not necessarily manageable to represent as systematized data, but may be relevantly explored in a traditional narrative review format.

A significant concern with any sort of attempt at systematic review, in this topical context, would be that, in certain areas of creativity research, this type of full systematic method is a methodological impossibility or, at the very least, a fraught challenge. This is due to the nature of the terrains of education and psychology in which creative self-belief literature is often situated. These are areas that are not often built upon the types of clean, positivistic approaches to data and research that are common in medical, business, or scientific fields, in which most systematic reviews originate and, indeed, in which systematic reviews originate as a method. Thus, the literature itself does not always lend itself to conversion into systematic data.

This also presents a limitation within creativity research itself, because although some positivistic and quantifiable studies exist in creativity, they are more often around the psychometrics of creativity or cognitive approaches to creativity. Within the newer and somewhat emergent, exploratory area of creativity and self-beliefs, there are certainly interesting and worthwhile points of scholarship to review and consider, but these are often more inimitable and may be theoretical or qualitatively focused approaches or methods that are less easily empiricized into a full systematic review. As Tranfield et al. [32] note:

Systematic reviews, due to their positivistic origins, sit comfortably with studies that use quantitative methods such as randomized controlled trials, quasi-experimental designs, and cost-benefit and cost-effectiveness studies, *therefore*, establishing criteria for ascertaining what is “relevant” or “good quality” in qualitative research provides a further challenge [34]. With qualitative studies there is no possibility of testing statistically the significance of the results (p. 216).

Thus, our reporting of each area of literature, as follows, is more narrative than systematically data-driven. Although we do not present a full systematic review method, we have aimed to be methodical about our search process as noted, and clarify the logic of our approach. Through this, we seek to help the reader understand the logical train of approach to each theory, to understand significant points of interest that might be culled from each theoretical area, for consideration in creativity and business training.

4. Examining Theories of Creativity and Self-Belief: Creative Identity, Mindset, and Self-Efficacy

In promoting creativity in the field of business, it is important to understand factors linked to supporting individuals' creative development from an education perspective. Beghetto and Dilley [22] have noted that one of the most essential drivers of whether individuals are able to think, act, and work creatively, depends on their own self-beliefs about themselves as a creative individual. Without creative self-belief, or a sense of one's potential and ability to be creative, it is difficult to function creatively.

As educational researchers examining creativity in business education and training, we suggest that core theories dealing with self-belief can help us understand what supports creativity. These theoretical foundations involve creative identity, creative mindset, and creative self-efficacy. We review each, then connect this to the value of arts-based interventions and learning in business.

4.1. Identity Theory

The primary source originators of identity are Stryker [27] and Burke [28]—and this primary work furthered their later collaborations on the topic. Among primary identity theorists, such as Stryker and Burke [35], the use of the term *identity* involves components of a view of the self, or the meanings people attach to themselves based on roles they play in contemporary societies. Identity theory points toward either explaining how social structures impact the self [27], or to how the sense of self impacts social behavior [28].

There are two notable points about identity formation. First, an individual has multiple identities that interact with each other based on the systems they operate in. Second, these identities are initially situation-specific but, over time, they are organized into a hierarchy of identities [36]. Their most salient identities are at the top of the hierarchy. Identity salience is defined as the probability that an identity will be invoked across varied situations [35]. Identity theorists have noted how, when an identity has higher salience than other identities, more significant behavioral choices connect to that identity.

Creative Identity

Creative personal identity (CPI) is defined as “the belief that creativity is an important element in a person's self-definition; and creative role identity is about how important being creative is in each given position” [37] (p. 248).

Studies related to creative personal identity are relatively recent, whereas research measuring “artistic identity” has been studied since the 1970s. Most research on creative identity or related concepts has showed up in the academic domain, focused on K-12 or college students, or in workplace domains focused on company employees. In business journals, effort has been spent toward testing or developing creative thinking skills that correlate with creative behavior, not identity. Importantly, some work on creative identity, thus far, has been linked to the arts.

For instance, in an extension to a study started by Getzels and Csikszentmihali [38], Freeman [39] studied the progress of a graduated group of art students from the mid-1960s to mid-1980s. He concluded that many individuals did not meet their artistic potential because of mythical, unrealistic expectations about being artistic. Debunking such myths and differentiating them from the actual creative process helped artists feel, and be, more creative [40].

Rostan [40] conducted a study exploring children's (ages 8–11) perceptions about being artistic and creative. The children participated in unstructured, open-ended interviews discussing their long-term painting projects and the process of creating art. Albeit a younger population than adults in business, the findings demonstrated salient points of identity production. Rostan's work illustrated how the motivation to work hard at developing a skill, such as creativity, related to an individual's artistic focus and their perception of what it meant to identify as an artist or creative person. Also, students perceived their identity as an artist to emerge from the act of producing art, rather than the

belief in an innate skill. Toward this point, other studies have also concluded that becoming creative is expressed in terms of incremental learning, rather than as innate properties [41].

In more recent studies targeting adults, Jaussi et al. [37] examined the relationship of creativity at work by exploring creative identity and its relationship with creative self-efficacy and problem-solving. Results suggested that creative identity explained the variance in creativity at work. Also, the positive relationship between creative personal identity and creativity at work was stronger when individuals had opportunities to engage in non-work experiences—such as arts-based activities—and apply these toward solving work-related problems.

There are different ways that some areas of scholarship consider identity with creativity. Some scholars look at the connection more generally, aiming to examine identity states alongside creative production, seeking to study how, or when individuals are prone to being creative, depending on identity issues [42]. Other scholars have sought to look at creative identity as a whole construct, and examine either its precursors [43] or consequences [44]. Others have tried to manipulate social identity in order to discover causal links between identity norms and creativity in certain contexts [45]. Much work on creativity and identity begins with the assumption that creative identity relates to creative performance. The relationship between creativity beliefs about the self and performance is studied under “creative self-efficacy”, and we examine this in a later theory section. While both self-efficacy and identity contribute to a more “creative self” factor, identity underpins self-efficacy, and may enhance its effects across contexts [46].

Glăveanu and Tanggaard [47] suggested that creative identities are considered representational projects which emerge in the interaction between self (the creator), multiple others (different audiences), and notions of creativity informed by societal discourses. They note that, in order to properly consider the link between identity and behavior, we must understand more than just how important a given identity (e.g., a creative identity) is for an individual. We need to understand what this identity actually *means*, for the person.

A relevant concept here, for creative identity, is the idea of a “Voice of Judgment”, or, an internal monologue that critically judges our work and actions and affects our willingness to engage creatively. This is predicated on the fact that each human individual has thousands of thoughts on a daily basis; and along with that, comes an internal voice that judges and filters these thoughts. While this idea was not initially coined alongside the term “creative identity”, it has since been noted by scholars and practitioners as relevant. In the literature, Ray and Meyers [48] gave a name to this as the Voice of Judgment (or VOJ), which is inextricably tied to our sense of identity. They claim that even a slight decrease in judgment increases an individual’s ability to respond more creatively in various situations. This internal voice is the sum of all voices from past experiences in one’s life. In order for a creative voice to come though, one must become aware of and address silence, or even destroy their VOJ.

Ray and Meyers [48] suggest that it is possible to silence one’s VOJ with concentrated effort. The development of a creative identity at any age is a continuing and dynamic process. In fact, an individual’s creativity and personal identity grow and change together, since they develop at critical points in life based on experiences [49]. One method often used in the arts to help people identify and manage their VOJ involves creating a visual representation of the VOJ as a physical entity (through drawing, modelling, or other means). This serves to personify and represent it outside of the individual to help one de-identify with the voice [50]—and this common psychological technique of the VOJ (which is often embodied or worked with in arts-based interventions) has become an intermediary step in beginning to identify and allow creative identity, by acknowledging the views that work against it.

4.2. Mindset Theory

The concept of mindset further provides theoretical grounding for creative experiences that enhance self-belief. Mindset describes the effects of the beliefs that people hold about the nature of their intelligence—and with “creative mindset” this is extended to beliefs about their creative abilities.

“Mindset” is a type of implicit theory—meaning it is a personal construction about a particular phenomenon that resides in the minds of individuals. Sternberg [51] noted that implicit theories must be discovered, rather than invented, because they already exist in people’s heads. He investigated beliefs that people held about traits they felt *other* people ought to have. Dweck, on the other hand, was more interested in beliefs people held about *their own* abilities [52], and she introduced the term “mindset” as an implicit theory that focused on explaining beliefs about abilities people valued and sought in themselves.

Dweck’s original research started in the mid-1970s when she challenged the common belief that intelligent people are *born* smart. Through empirical studies, she demonstrated that individuals’ perceptions about their intellectual abilities could dictate their intellectual achievements. Dweck has provided evidence that people who hold a *growth mindset* think that intelligence is malleable, intellectual ability is learnable, and talents and abilities can be grown with one’s effort and help from others [27]. Mistakes are not viewed as a cause for condemnation but, rather, as information to improve, grow, and develop [53].

On the other hand, people who hold *fixed mindsets* believe they have a certain amount of intelligence, talent, or ability, with no room to build upon them. Such a belief holds people back from trying new experiences, because fixed mindsets protect an ego identity that does not allow for admitting mistakes [27]. In a fixed mindset, learning, risk-taking, and adaptation drop off, while the need for perfection, or a correct answer, rules [53].

Creative Mindset

Dweck’s mindset research has served as the foundation for researchers to study creative mindsets. Dweck primed the idea that her growth/fixed mindset work is transferable to creativity research by referring to a poll of 143 creativity researchers, noting that perseverance and resilience, produced by the growth mindset, was the top ingredient in creative achievement [27]. Karwowski [54] formally defined “creative mindset” as “beliefs about the [fixed] versus [growth] character and nature of creativity” (p. 62). Karwowski indicates that, like intelligence, people often believe creativity is fixed, and that only a few geniuses are truly creative. Yet, people with growth mindsets believe that creativity is trainable, and can be developed much like other characteristics [55].

The relevance of creative mindsets as separate and unique constructs is often established through three main sources: (1) the examination of belief systems of creativity is necessary, given that intelligence is different than creativity [19]. Thus, people may have different beliefs about the nature of their own creativity than they might about intelligence. (2) Researchers have established that the myth that people are born creative (a fixed creative mindset) is deeply detrimental and harmful to the enhancement of creative performance [14]. (3) There is evidence supporting the construct validity of creative mindsets and their contribution to mindset theory more broadly. One study found that implicit theories of intelligence could not predict creative problem solving, yet a growth creative mindset did positively predict creative problem solving [54].

The more straightforward takeaway is that mindset is important because perceptions of creativity influences an individual’s desire to engage in, or disengage from, creative thinking and activities. Prior research has shown people with growth mindsets exert more effort and deal better with failure, as they see it as an opportunity to learn and grow [56]. In fixed mindset, failure is considered a threat, and the risk of failure de-motivates people from engaging in challenging activity [57]. Therefore, creativity researchers expect those who hold growth mindsets to engage in creative tasks, and those with fixed mindsets to avoid tasks that are seen as complex or creative [55].

With respect to identity and mindset, when people do not think that creativity is important in their self-description, they are characterized as having low creative personal identity (CPI) [46]; and they, likely, will not care whether creativity is malleable or fixed [54]. Thus, it is important that people both view creativity as amenable to growth, and that they see it as valuable to their self-description.

Motivated by previous findings, researchers such as Hass et al. [58] asked if the relationship between mindsets and everyday creative behaviors depended on academic domain. The simple answer was, no—but the strength of the relationships varied across the five domains in this study, which included Arts and Humanities, Business, Education, Life Sciences, and Social and Behavioral Sciences. Specifically, business students demonstrated a negative correlation between fixed mindset and everyday creativity; conversely, they also demonstrated a positive correlation between growth mindset and everyday creativity—even more so than art students—which suggests that promoting growth mindset in business students enhances their everyday creativity, and/or vice-versa.

Puente-Díaz and Cavazos-Arroyo [59] examined the influence of creative mindset on achievement goals, creative self-efficacy, enjoyment, and perceived performance and effort among college business students from Mexico. Their work provides an example of the study of creative mindset on students in a business educational setting. They noted a positive influence of a growth creative mindset on task-approach achievement goals (mastering a given task) and creative self-efficacy (a belief in their creative ability). Interestingly, a fixed creative mindset had a positive influence on other-approach achievement goals (a goal of outperforming others, rather than deep engagement for mastery or creativity within the task). Their work finds that growth creative mindset had a direct, positive influence on creative self-efficacy and the students' perceived performance and effort exerted, as well as an indirect influence on enjoyment. They conclude that holding a growth creative mindset is, thus, related to adaptive motivational and performance creative outcomes in business education settings.

Finally, researchers have viewed mindsets as beliefs *related* to creativity, but not the same as self-beliefs [55]. Theoretically, mindsets *shape* self-beliefs and, empirically, have been proven to relate to creative identity and self-efficacy in correlational studies [54,58,60]. How people perceive the nature of creativity can shape their self-beliefs, leading them toward either a growth or fixed mindset about learning to operate creatively in tasks. This is critical in training to foster creativity in others. Additionally, prior studies have demonstrated a correlation between creative identity or creative mindset and our third self-belief construct, of creative self-efficacy.

4.3. Self-Efficacy Theory

The final theory we deal with, related to creativity and self-belief, is self-efficacy theory. Much like identity and mindset (implicit) theories, self-efficacy theory plays an integral role in determining performance [30,52]. This theory was originally established by Albert Bandura [30], and self-efficacy is defined as “people’s beliefs about their capabilities to produce designated levels of performance that exercise influence over events that affect their lives” [61] (p. 1).

The strength of a person’s beliefs about their effectiveness in any given task influences their choice of behavior [30]. A person’s efficacy expectations or perceived self-efficacy determines how much effort they will exude, and how long they will cope with failure or obstacles. Stronger perceived self-efficacy leads to more effort.

Adding to this correlation, Bandura explains that people fear and avoid threatening situations they know they cannot cope with. However, if they persist against these fears, they will gain corrective experiences and eliminate defensive behavior, while those who do not persist will remain fearful, with self-debilitating expectations.

Creative Self-Efficacy

In creativity literature, creative self-efficacy is defined as the self-view that one has the ability to produce creative outcomes [62]. When creativity is concerned, some people can perceive creative performance as a threatening and arduous task, especially if they have not built prior mastery in a genre before. As a result, they are less likely to choose activities or settings that push them to be creative.

Other studies have also suggested that higher creative self-efficacy leads to greater creative performance [62]. Empirical work has demonstrated that creative performance is associated with

creative self-efficacy at the individual level [63], at the team level [64], and within diverse industries, such as education, operations, manufacturing, financial, insurance services, and research and development [37,64–67].

Creative self-efficacy is considered malleable. It can fluctuate with changes in self, task, or social context-related factors [68], and can be influenced by past performance accomplishments, vicarious experiences, verbal encouragement, and emotional states [61]. Even with such fluctuations and influences, empirical studies demonstrate that creative identity has a positive relationship with creative self-efficacy, even though they operate as two distinct psychological constructs [37].

Some scholars have studied creative self-efficacy as one of the antecedents of innovation within business and organizational contexts, and it has been identified as a key driver of employees' innovative behavior. For instance, Hsu et al. [69] found a significant effect of creative self-efficacy on employees' innovative behavior, and Tierney and Farmer [68] reported that creative self-efficacy was a strong predictor of employees' creative performance over time. Newman et al. [70] examined whether entrepreneurial leadership (an approach characterized by the leader influencing and directing team members to recognize and exploit entrepreneurial opportunities) influences the extent to which employees with different levels of creative self-efficacy engage in innovative behaviors. They suggest that the influence of creative self-efficacy on employees' innovative behavior is stronger for employees who work in a team with strong entrepreneurial leadership because entrepreneurial behaviors motivate employees to derive creative ideas and implement them. In short, the contexts and influences in the workplace—such as a leader's approach—demonstrate the capacity of creative self-efficacy to influence business innovation.

Along similar lines, Jaiswal and Dhar [71] investigated the mediating role of innovation climate and moderating role of creative self-efficacy. Their findings demonstrate that employees with high creative self-efficacy resort to creative behavior when they receive a supportive innovation climate. Thus, creative self-efficacy has a key role to play in the innovative capacity of businesses, and it can be maximized through supportive environments that seek to empower creative behaviors.

Other studies within organizations have also found that an employee's creative self-efficacy has a significant effect on the individual's creative behavior or creative outcomes [62,72]. Richter et al. [73] suggest that a strong belief in one's creative-self extensively motivates individuals to seek consultation and guidance in applying creative behavior.

Bandura [30] has emphasized the reciprocal relationship between creative behavior and creative self-efficacy, yet, there are few studies that investigate the interaction effect of creative self-efficacy in predicting employee creative behavior. Richter et al. [73] also recommended studying the interaction effect of creative self-efficacy. They assert that a strong belief in creative self-efficacy motivates individuals to seek consultation and guidance in applying creative behavior.

Interestingly, the interaction effect between creative self-efficacy and creative behavior suggests that the effect goes both ways, and that engaging in creative behaviors may lead to enhancement of creative self-efficacy, as well. Bandura's self-efficacy theory provides an understanding that cognition associated with creativity plays an important role in the acquisition and retention of behaviors. Thereby, it becomes incumbent on business education to provide opportunities to support creative self-efficacy, if creative behaviors are desired in the workplace.

5. Findings: Bringing Together Creative Self-Belief Theories and Arts-Based Methods

We have considered several key theories from educational psychology, to better understand the importance of developing creative self-belief in business settings. Theories that deal with creative self-belief—such as identity, mindset, and self-efficacy—emphasize the importance of promoting a sense of the self as a creative person with creative capacity.

Our guiding questions for this literature sought to explore these areas of creative self-belief, with an eye toward how creative self-beliefs may relate to, or inform, arts-based creativity training.

A common finding or narrative of the literature, that ties together each of these reviews of theory, suggests that, for someone to transform their creative potential into creative action, they must have confidence in their ability to act creatively and believe that there is value in doing so. Without this, there is little chance that they will be able to reach their creative potential, or even that they will seek to engage in creative behaviors or creative thinking [22]. Creative self-efficacy was shown to be a driver of innovation in organizational contexts [69–71], but it also deeply connects to creative identity and mindset. This is an important takeaway in reviewing the literature—in noting that these theories often work in reciprocal ways, and work to affect each other within an individual’s construction of their own self-beliefs. Any of these areas can be influenced in an individual’s psychology by mediating experiences, and a change in one can effect changes in other areas. For instance, bolstering one area, such as creative identity, tends to have an enhancement effect on creative self-efficacy; or, a shift in creative mindset (in terms of one’s beliefs about the nature of creativity) can relate to a shift in where creativity falls in one’s own identity. Thus, these theories have a synthesizing effect within individuals’ creative self-beliefs. This demonstrates the ways that working on developing one area can have relational effects on others. But, more importantly, to truly form a stronger vision of creativity within people’s self-beliefs, we must promote or provide educative experiences that seek to enhance or expand each of these theoretical spaces within human psychology.

Thus, creative self-belief theories align to suggest that, if the field of business seeks to promote more creativity from within, there is a need to engage people in educational activities that support creative self-beliefs. While there are many ways to do this, one key approach we suggest and explore further, as follows, is through the integration of arts-based methods.

Arts-based methods, or the incorporation of techniques and processes derived from the arts, have grown in interest in business education and training settings in recent decades [74]. Despite a common misperception that business and the arts have little to do with each other, business can learn from the arts, and successful artists and managers or leaders often share common characteristics—thus, business fields can develop and grow their creative and inventive capacity through connecting to the arts.

This, in some ways, represents a broader aim to cross-fertilize ideas between business and the arts [75]. Along these lines, Formica [76] notes that the most essential and challenging problems in management are not technical, but human-centered, in nature. In this, they may be supported by engagement with creative endeavor and different types of entrepreneurial identity [77]. Taylor and Ladkin [78] describe four different processes or goals in using arts-based methods in business settings. These include *skills transfer* (the development of skills from the arts to improve performance in business settings), *projective technique* (using the arts to reveal inner thoughts and perceptions that may not be otherwise accessible), *illustration of essence* (using the arts to understand the “essence” of an idea), and *making* (using the arts to foster a deeper experience of personal presence and connection to help managers and leaders experience themselves and their world in a more cohesive way).

While all of these four processes, identified by Taylor and Ladkin, could become critical functions of the arts in business, one that may be interesting to consider, when we aim to strengthen elements of creative self-belief, is the *projective technique* process. In this, the act of using art becomes a way to “foster reflection through projection” [78] (p. 58).

There is a relevant connection here to constructions of mindset, albeit not from an educational psychology standpoint, and not in the same sense as “creative mindset” in terms of psychological self-belief theories. Taylor and Ladkin [78] note Langer’s contention that “the primary function of art is to objectify experience so that we can contemplate and understand it” [78] (p. 58). In other words, in their conception, making or using art becomes a way to reflect about our own experience, allowing the individual to objectify their world sans limitation or logic already set up by their life. One can view, or make, an object for what it is (fixed mindset) or one can view additional uses and potential that goes beyond the obvious (growth mindset).

This viewpoint is inspired by the work of Paul Crowther [79], who suggests that the aforementioned process is possible because “the creation of artifacts, or engagement with such artifacts . . . enables us to articulate the structures of attention, apprehension, and projection in a way that draws on our cognitive and perceptual capacities operating as a unified field—rather than our intellectual capacities alone” [78] (p. 58).

This idea can also be a way to strengthen creative identity as art objects that people create or engage with can open up a window to the unconscious [80] and, depending on cognitive and perceptual capacities, one can project varied viewpoints, as capacities vary and are colored by past experiences and environmental factors.

When it comes to self-efficacy, however, people’s creativity is most often inhibited by fear, negative personal judgement, and chattering of the mind [48]. The key to personal creativity is to eliminate, or at least minimize, these limitations, to allow one’s creative essence rather than the ego, false personality, or external self, to project tacit knowledge. This technique indirectly uncovers falsehoods or fixed mindsets, through its creative awakening process. Springborg [81] explored arts-based methods using theories grounded in an embodied view of cognition, and determined that focusing on sensory experience enabled participants to remove judgments about the self and about others. This ability to suspend judgment may have relevance to the concept of the “Voice of Judgment” noted earlier, which must be suspended or silenced, in order for creative identity to flourish.

With respect to management literature, the projection technique, as an arts-based method, has been used in various organizational settings, such as to make invisible concepts like “culture” visible [82], or leveraging the tool called Visual Explorer, where individuals choose an image that best depicts a problem, and discuss the issue together to uncover various viewpoints [83], or use LEGOs to build an organizational strategy [84].

In essence, the projective technique relies more on one’s “gut feeling” rather than rational thought [78]. By reflecting on and working with the object, the “knowing in the gut” may be intellectualized into “knowing in the head”, Arguably, through time this may be a way to build a belief system within an individual that strengthens their own creative capacities.

This illustrates a potential relationship to creative self-belief—and, thereby, to cognitive processes such as creative identity, mindset, and self-efficacy. It directly references how engagement in the arts is not a one-directional act but, rather, is a bi-directional and symbiotic action of self meaning-making. The act of *reflecting* might also be extended beyond the original intent, into an act of *identity formation*, in which a person (an employee, leader, or manager) can begin to see themselves as having a creative identity through the action of engaging in the arts. In this, they may expand their own creative potential and ability, as suggested by Beghetto and Karwowski [23]. Springborg [85] also explores the idea of leadership as art as a phenomenon characterized by leaders working from their senses, rather than drawing on prior modes of sense-making, and by sense-making as a tactile and sensory process, rather than a solely analytical or cognitive one.

Creative identity and self-efficacy are positively correlated, and tend to increase or decrease together, suggesting that, if people engage in activities that enhance their identity in an area, they will also experience an increase in self-efficacy in that area [37]. As we have noted, Karwowski’s work [54] suggests that creative mindset is influenced by these elements, also—it is important that people both view creativity as amenable to growth, learning, and change, and to see it as part of a self-description.

All of these elements of self-belief, taken together, are thus amenable to influence by engaging in the arts. While scholars point out the varied ways that the arts can be valuable in business education, training, and development [78], we emphasize their influence on creative self-beliefs. This aligns with the instrumental goals of business education, toward developing a more creative 21st century workforce. But, it also allows for a more human-centered approach to business, in which employees and students can engage in work that is innately human, productive, and creatively fulfilling, toward becoming more self-actualized and creative people [86].

Despite the growing interest in arts-based methodologies, and work that suggests their value toward developing creativity, several scholars have pointed out that there remains a lack of empirically grounded work in this area [87], and that more attention is needed toward arts-based methodologies in business, to better understand the experiences of participants.

While the practice of arts-based learning in business is growing, there is a need to better understand how this, and other, methodologies might be used to enhance areas of creative self-belief (i.e., identity, self-efficacy, and mindset). To this end, in the next section, we describe the design of an in-progress intervention with arts-based methods, for developing creative self-belief among business students at the Thunderbird School of Global Management at ASU.

6. Current and Future Directions: Enhancing Business Students' Creativity

The authors are engaged in the execution of an action research intervention focused on student creativity training for students in the Thunderbird School of Global Management at Arizona State University. Given that we have discussed creative self-belief theories and proposed their relevance for creativity training in business, we now describe an example of an intervention model we are currently working with. This work will explore the influence of creativity workshops (which include a mix of arts-based and other methods) on business students' perceptions of creative identity, creative mindset, and creative self-efficacy. The project is in progress at the time of writing, so this paper does not focus on data outcomes, but simply concludes by sharing it as an example of an intervention design that explores these creative self-belief constructs in the context of business education and arts-based methods.

This first author of this article is the designer and leader of this project and inquiry, in her role with global recruiting. As a Thunderbird School of Global Management recruiter with eleven years of industry experience, she observed many organizations' lack of understanding of, and appreciation for, fostering creativity via an inside-out approach. Therefore, this project seeks to address this by developing a training program that might address the gap.

The incoming freshman class that are participating in this intervention will graduate into and enter a workforce comprised of over 50% knowledge-work jobs, which will require them to be social, emotional, creative, and relational. This creativity-focused workshop series was designed to empower students to understand the preconditions of being creative, to utilize their talents, education, and life experiences, and to be the change agents they set out to be.

The Thunderbird School of Global Management at Arizona State University has been historically recognized for its graduate program, currently ranked 7th in the United States for international business specialty [88]. The prestige of the school's reputation has crossed over to its bachelor's degree programs, as many faculties teach both at the bachelor and master's level. In addition, ASU has ranked number one in the United States for the most innovative university from 2016 to 2018. Freshman students are required to take a 1-credit first-year seminar course at the beginning of their program, and this creativity training/intervention will be part of the seminar.

Currently, Thunderbird's freshman seminar curriculum does not include any explicit course objective to teach about creativity or consider students' creativity as a skillset. Therefore, this project seeks to offer creativity training (incorporating arts-based and other methods), and to also evaluate business students' perceptions about their personal everyday creativity, based on associated variables, i.e., creative identity, creative self-efficacy, and creative mindset theories. The goal is to set the tone and serve as initial steps toward developing students' creative competency throughout the entire program, as students move toward becoming global business leaders; ideally, the training may later be scaled up or infused throughout Thunderbird programs.

6.1. The C3 Innovation Project

For simplicity, this creativity intervention is called "C3 innovation", based on the three creative self-belief constructs. Within this partially arts-based intervention, we will also seek to collect and

evaluate data for the action research purposes of understanding the effects of such training on these self-beliefs (e.g., as part of the project, we will employ a concurrent mixed method research design with qualitative and quantitative data).

The C3 project is designed to (a) evaluate students' perceptions about their personal everyday creativity and (b) empower them with strategies to enhance their understanding of the importance of being creative. The project was inspired by a study from Hass et al. [58], in which they measured fixed and growth creative mindsets, and the relationship to creative self-efficacy and creative identity, to create a model of a more complete picture of people's self-perceived creative competencies. The researchers concluded that these constructs are separate but interrelated constructs, and students with high creative self-efficacy tended to endorse creative growth mindsets.

This project will include three phases: educate (training), survey, and interview. We focus on describing the face-to-face training, as an example of intervention work in this area of arts-based training in business but, also, share a few details of how we will collect data, to reflect the evaluative nature of such work.

6.1.1. Educate Phase

During the educate phase, there are three facilitated workshops every week, focusing first on creative mindset, then creative identity and, finally, creative self-efficacy. Participants will be tasked to learn concepts and participate in methods and tools in each workshop—engaging in some arts-based, as well as self-reflective/reflexive and other creativity training techniques—and working on related homework and supplemental learnings to aid their comprehension. Also, at the end of each workshop, participants will provide feedback.

In the creative mindset workshop, students will be tasked to enhance their neuroplasticity by utilizing arts-based methods. As an example, in one exercise, the students will draw a personal vision statement for the next five years. Another mindfulness exercise will allow them to meditate via repetition of mantras such as "I will live a creative life, I will . . . ". Another exercise will allow students to create a personal artistic-digital gratitude journal via Instagram, where they can select any digital images they wish to create into a montage or collage of image-based perceptions of creativity with respect to their own lives, and to share why they are grateful.

In the creative identity workshop, the students will learn how their identity informs ideation. In one exercise, students will list all possible identities connected to them, e.g., brother, student, etc., then they will select a random object provided by the facilitator and come up with as many ideas as possible and discuss. The point is to exchange ideas and see that they are coming up with different ideas because of the identities they assume. Another exercise involves constructing a visual representation to represent a personification of their Voice of Judgment. By creating and objectifying the voice that limits their creativity, students will engage in discussion about how to separate that critical voice from their own self-perception—to manage or control the voice, so it does not deter them from engaging in the creative process. The final exercise is to develop a list of people who motivate them to be successful in every facet of their lives. In other words, this is to develop a counter to the VOJ, as a Voice of Persistence (VOP), i.e., people who they can keep close to persist in developing a creative sense of self.

In the creative self-efficacy workshop, the students will engage in a theatre-based improv game called "yes, and", where they will complete sentences in pairs by adding "yes, and" in the first round. Next, they will say "yes, but" where they will see how such a simple phrase kills ideas during conversations, and how they should be aware of it. Along this same line of theatre technique, they will also engage in another improv game where pairs will share their passion and interests in 30 s, and then sketch out a startup idea in three minutes. The aim of this game is show how easy it can be to ideate and visualize ideas. The final exercise is called the 1, 2, 3 game, where students will number off 1, 2, 3 until somebody makes a mistake. The game will incrementally become harder in further rounds. The point is that posture affects how we feel about making mistakes. In the game, the

students are encouraged to take a celebratory at the end of their routine to celebrate their mistakes and, most importantly, to then reflect on what can be learned in mistake-making to iterate toward their next moves.

6.1.2. Survey Phase

During the survey phase, the participants will respond to three online surveys. The first survey is a post-workshop feedback survey after each of the three workshops, to assess its effectiveness and capture how, or to what extent, these workshops helped students understand creativity and its preconditions related to their creative potential and self-belief. The second survey, offered immediately after the third workshop, will assess their self-perceived everyday creative competencies, measuring the three constructs of creative identity, creative mindset, and creative self-efficacy. The third survey, a retrospective pre-intervention version, administered a week later, will evaluate the same three constructs assessed on the post-intervention survey. The retrospective survey lets students to respond to the same survey items, but they are asked to think back to the beginning of the semester, before the intervention. They rate the items using the same criteria they had learned through participating in the creativity workshops, to avoid a response shift bias.

6.1.3. Interview Phase

During the interview phase, we purposively sample eight to ten students one week after the workshop and surveys are completed. The interviews aim to help us better understand the results of employing such an intervention, through understanding (a) perceived vs real limitations and/or inhibitors/motivators of everyday creativity, and (b) examples of each students' personal everyday creativity before or during college, to inform future iterations of professional development creativity workshops, and (c) to evaluate the intervention and what aspects of the creativity training may be useful to include or adapt in the future.

We share the design of this creativity intervention as an example of ongoing work that seeks to connect constructs related to creative self-beliefs and consider where creativity training, including arts-based methods, may be instantiated in business education, training, and research.

7. Conclusions

We have drawn a connection between calls for a more creative workforce and the potential of arts-based methods in business education, focusing on the importance of theories of creative self-belief, including creative identity, creative mindset, and creative self-efficacy. The popularity of business as a major has steadily risen in recent decades; and there has also been a realization, in popular and scholarly discourse, about the need to develop skills, aptitudes, and inclination toward creativity among employees, leaders, and managers in business. It is incumbent upon business education, professional development, and training, to incorporate methodologies that enhance creative capacity. But this is easier said than done, and it is important to consider methods and approaches—particularly in the arts—toward building creative capacity in business students and employees.

We have asserted that it may be beneficial to consider theories from psychology and education that explain conditions and elements related to thinking, working, and acting creatively. Specifically, in this literature review, we focused on three theoretical constructs related to creative self-belief (or the beliefs that individuals have about their own creativity). By reviewing these theories, we examine constructs that comprise what it means to identify as a creative person, and to value and believe in one's own creative capacity. Literature in these areas points to creative self-belief as a key to unlocking an individual's creative potential, and to the deep interconnections between creative identity, mindset, and self-efficacy, which can be explored and used to enhance individuals' capacity with business education settings. Notably, the findings around these theories imply that they often relate to and affect each other within individual human psychology. Thus, working to expand or bring forward any facet of creative self-beliefs may enhance others. A more cohesive and strong effect may be possible

through interventions that seek to work upon all three theoretical aspects of creativity and self-beliefs (e.g., one example is found in the C3 instance we have shared here).

While there are varied pathways to expanding creative self-belief, one common theme that recurs is in arts-based methods. Richards [89] and others point to the ways that engaging in the arts is valuable toward constructing a creative sense of self and giving people new ways of viewing the world and working, thinking, and acting creatively within it.

Arts-based methods are a vital area of growth in business scholarship and practice, and while much work has already pointed to their potential, many have also pointed to the need to expand theoretical and empirical work in this area. We have shared one example of an intervention project in progress aimed at investigating this area of arts-based and other methods toward creative self-belief. As more work grows in this area, it will be important to consider multiple ways of knowing and understanding the world as a creative person. This is an area in which business and education can inform each other, living and thriving at the crossroads of creativity.

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Article

Collaborative Innovation: Exploring the Intersections among Theater, Art and Business in the Classroom

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Abstract: There is a long history of conversations about integrating business and arts-based learning, but they are taking on more urgency today as technology-induced change and global interconnectivity are altering how humans learn, create, and construct new knowledge in unprecedented ways. However, there is much still to be learned about how the disciplines might be integrated and in what ways they can jointly serve the development not only of university students, but of how professional practice itself is defined. Over the past three years, faculty from the Theater and Dance Performance Studies, Art Practice, and Business disciplines at UC Berkeley have collaborated to create a course, *Collaborative Innovation*, that explores both collaboration and innovation at the intersection of these three fields. This paper presents a framework for a genuinely integrated interdisciplinary class that interweaves personal development and growth with problem framing and solving skills, and diverse-team participation and leadership. Quotes from student reflection papers bring alive the transformational experiences students went through in this course. The integration of socially engaged art, business, and theater/performance through collaborative teamwork tackling important and challenging social problems opens unexpected potential for student development as future contributors to society.

Keywords: collaboration; innovation; cross-disciplinary; intuitive thinking; qualitative thinking; communication; team building; problem solving; risk taking; design

1. Introduction

“To drop the tools of rationality is to gain access to lightness in the form of intuitions, feelings, stories, improvisation, experience, imagination, active listening, awareness in the moment, novel words, and empathy. All of these nonlogical activities enable people to solve problems and enact their potential” [1] (p. 15).

There is a longstanding discussion of the value that liberal arts brings to business education. As far back as 1890, Charles William Elliot, president of Harvard, argued that the liberal arts develop a “sense of right, duty and honor” along with communication capabilities needed in business [2]. Today, driven to define entirely new experiences for and with customers and users, companies are increasingly looking to the arts and artistic processes for the “anticipatory creativity” needed to design those new futures [3]. Embedding liberal arts content in business courses enables students to find informed solutions that are both technically superior as well as critically and ethically evaluated [4]. In addition to designing creative new futures, leveraging liberal arts content positions students for the flexible, increasingly global, and diverse workplaces of the future [4], and to be part of redesigning the future workplace and thus their own work experiences [5]. Literacy in the arts can prepare students to

work collaboratively within a collected intelligence, participate in social networks, negotiate cultural differences, critique existing paradigms, and navigate contradictory data [6,7].

Parenthetically, although it is not the focus of this paper, there is also discussion of the value of business learning to the arts. The textbook *Management and the Arts* [8], for example, covers management fundamentals—from economics to human resources management to fundraising for managers of arts-based organizations. Over time, the development of a business connection to the arts has resulted in the development of new fields of strategic arts, cultural management and cultural entrepreneurship [9]. This paper focuses more on the value derived in business from integration of arts-based pedagogy and curriculum.

From a skills perspective, business increasingly requires intuitive and qualitative thinking, communication and presentation skills, team building and problem solving, and the ability to understand undefined outcomes while allowing for failure and risk taking. The arts can help business students develop needed imagination, critical discourse, spatial thinking and abstract reasoning, and active listening and observation skills [10]. Learning from the arts prepared information technology professionals, for example, to better interpret complex, ambiguous situations, interact with experts from other fields, and constructively evaluate their own work and the work of others. These skills are seen as a complement to the more rational, scientific models that otherwise inform IT education [11] and management practice more generally [1,12].

Development of these capabilities is needed all the more today when technological change is happening at an exponential rate and creating unprecedented large-scale systems change [13] that has caught both educational institutions and industry leaders unprepared. Dealing with the complexities of a highly interconnected and fast-moving world requires a new set of approaches to complement, if not entirely replace, traditional tools and understanding of when to drop familiar tools to make room for new ones [1]. How can we best prepare students—business and non-business majors alike—to not only live, work, and relate to others in this new world, but more importantly to design that world so that we all want to live and work in it? In what ways does professional practice need to be restructured to be nimble and responsive to the changes that are upon us? How and when is it appropriate to “drop the tools of rationality” [1]? The answer, many argue, is in the integration of the liberal arts, or arts-based education, with business education.

Is it enough, however, to simply embed some arts classes into business education, or do students need a deeper experience, a transformation perhaps, that better prepares them for changing world paradigms? Are the professions as we know them today the professions needed for a future world? If not, how should we approach redesigning them? As traditional constructs that support concrete boundaries between disciplines and professions shift and change, arts discourse offers an expanded perspective on the complex systems that structure contemporary experience, creating space in which to offer critique, alternatives, and perspective on their impact. This in turn can allow students to consider not only their own effectiveness in relation to cultural change, but also how they can act most wisely, sensitively, and courageously within their fields.

Collaborative innovation as represented in this paper is more than a pedagogical framework; instead, it more broadly reflects the ways in which professional fields of practice are now entwined. Interconnectivity is fundamental to global networks of cultural exchange. Given this contemporary condition, might collaborative innovation itself define a profession in the future? If that is the case, are we ready with educational models that can teach it? In this paper, we approach these questions through the lens of a *Collaborative Innovation* course developed at UC Berkeley as a joint effort across three disciplines—Art Practice, Business, and Theater/Dance and Performance Studies—and offered to undergraduate students from across the campus. The paper explicates frameworks that can be used to think beyond the role of the arts in business to actual integration of arts and business. While the course facilitates learning through “knowing” (theory-based reading and discussion) and “doing” (application of theory through hands-on exercises), it is the immersive experience across the three disciplines, guided by structured frameworks, that allows students to engage in a journey of

“becoming” [14] contributors in a highly complex and dynamic world. The description of the course and associated frameworks provided in this paper aim to help create common language, identify key skills and capacities of creativity and how they can be developed across disciplines, and show how faculty from different disciplines can work together to create an integrated learning experience that is transformational for students [15].

2. Collaborative Innovation Course: Background and Frameworks

2.1. Collaborative Innovation Course Description

Collaborative Innovation was first offered in Spring 2016 through the Big Ideas Courses program in the College of Letters and Science at UC Berkeley. The program sponsors cross-disciplinary courses aimed at exposing undergraduate students to dialogue among faculty with different perspectives on a big issue. In this case, the objective of the course was to bring together innovation practices from the worlds of theater, art practice and business to offer students a cross-disciplinary, collaborative problem-based learning [16,17] experience.

The faculty who founded the course proposed three perspectives on innovation: (1) theater faculty described their contribution as a laboratory in developing and generating new performance works around shared life experiences through iterative writing and performance exercises; (2) business faculty focused on using human centered design techniques to leverage technology in creating better customer, user and stakeholder experiences that ultimately lead to better business outcomes; and (3) art practice faculty aimed to have students define the unspoken rules and norms of public space and utilitarian objects and create dynamic, physical, and social explorations that challenge boundaries.

The class was structured in a studio format. It met for three hours twice a week giving faculty and students ample time to connect and learn together. All faculty attended all thirty class sessions during the semester. There were sixty students in Spring 2016, sixty-one in Spring 2017 and seventy-four in Spring 2018. Table 1 provides a breakdown of the majors for students who were declared at the time of the class; twenty-eight percent of the students had yet to declare a major and are not included in the statistics presented. Students majoring in Art Practice, Business and Theater/Dance, and Performance Studies comprised slightly more than a third of the declared students in the classes over the three years. Cognitive Science, Computer Science, Engineering and Media Studies students comprised another third of the classes. The remaining third represented sixteen different majors from Economics to English. The significant diversity in majors represented in the class, along with diversity in gender, ethnicity and socio-economic background provided ample opportunity for students to learn from a wide variety of perspectives and leverage a wide range of problem-solving approaches (heuristics) [18] throughout the course.

The Spring 2018 structure of the class consisted of an introductory week during which students completed two short innovation exercises, one in pairs and the second in teams of four or five. Three two-week modules followed the introductory week, each introducing the perspective on collaboration and innovation from one of the three disciplines. In the first module (theater), students shared an object that is important to them and, in small teams, iteratively built a performance around shared themes identified in their object sharing. They were introduced to body movement and performance design fundamentals and shared a short two-minute performance in class on the last day of the module. After the performance the students received feedback from both peers and faculty. In the second module (art), students developed an understanding of Socially Engaged Art [19]. These explorations iteratively led students through creative processes in which they considered, questioned, and critiqued systems in their lives and communities. They shared their work on the last day of the module and engaged in a formal critique process in which peers provided feedback on the work. The third module (business) took students through the process of finding a customer need for a technology, designing a solution around the customer need, and building a business model around that solution. Students pitched their ideas and business

models in the last session of the module, receiving feedback from peers and faculty. Each of the three modules was completed by a different set of cross-disciplinary teams of students.

Table 1. Majors represented by declared students in *Collaborative Innovation* 2016–2018.

Major Category	Number of Students	Percent of Students
Art, Practice, History	19	13%
Business	18	12%
Theater, Dance Performance	18	12%
Cognitive Science	13	9%
Computer Science	12	8%
Engineering	10	7%
Media Studies (Film, Communications)	8	5%
Economics	7	5%
Political Economy/Science	7	5%
Architecture	6	4%
Environmental Studies	5	3%
Sociology	5	3%
Science (Chemistry, Biology)	5	3%
Other (16 majors represented)	18	12%
TOTAL DECLARED MAJORS	151	100%

Table excludes 47 students who were undeclared and 11 students for whom there is no information on their majors. For students who were double-majoring, both majors were counted.

Once the students were grounded in the three disciplines’ approaches to collaboration and innovation, they launched a final project around a topic of interest to them in the final seven weeks of class in which they synthesized and applied their learning from the three discipline-focused modules. Students received input from all course faculty and were taught additional skills around, for example, systems mapping, project management, and team dynamics. These projects have focused on such topics as mental health on the UC Berkeley campus, the toxic effects of Instagram, awareness of social and racial biases, and support for shy or introverted individuals. At the end of the semester, students displayed their work at a showcase event during which they received feedback from peers and course faculty as well as outside jurors who were invited from a variety of departments and industries.

2.2. Frameworks Used to Integrate the Disciplines

Over the three years the course has been taught, nine faculty from the three disciplines have participated. Weekly faculty meetings during the semester along with many preparatory meetings provided time for faculty to learn about how collaboration and innovation were approached by each discipline and to synthesize frameworks used in the class to integrate the various pedagogical and disciplinary practices. The following two sections describe the two frameworks in which the class is now grounded and relevant theoretical underpinnings. The first framework describes innovation as a learning process, which provided space for the integration of discipline-specific approaches to innovation, design, and creative work; the second framework overlays development of leadership skills in the dimensions of inner, other, and outer focus on that learning model.

2.2.1. Innovation Cycle

The first framework now used in *Collaborative Innovation* (Figure 1) integrates experiential learning theory [20] and design [21] to depict innovation as a learning process [22]. In learning, as individuals or as teams, we toggle between being present in the concrete world (concrete experience) and being in our heads (abstract conceptualization). We further toggle between reflective observation, or analysis work, and active experimentation, or synthesis work [23]. The four quadrants formed by this learning framework highlight the four core categories of mindsets, skillsets and toolsets associated with design or innovation (and more broadly with problem framing and solving).

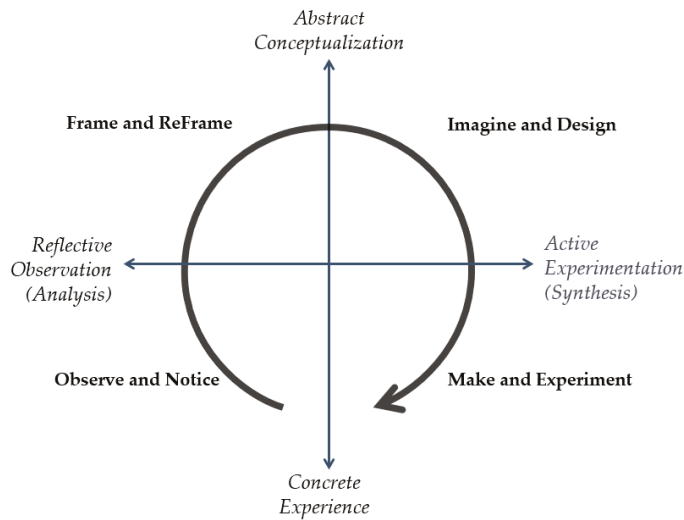


Figure 1. Innovation as a learning process [22].

Observing and noticing happen at the intersection of concrete experience and reflective observation. *Observing and noticing* are tightly intertwined with *framing and reframing* in a process deeply examined in the sensemaking literature. “Sensemaking is a motivated, continuous effort to understand connections . . . in order to anticipate their trajectories and act effectively” [24] (p. 71). The creation and appreciation of meaning or sensemaking is a “definitional property of a cognitive system” [25] (p. 488). Meaning-making systems from an arts-based perspective honor diverse ways of knowing—personal, narrative, embodied, artistic, and aesthetic—that often stand outside sanctioned intellectual frameworks [26]. These approaches often stand in sharp contrast to the rational–analytical–logical systems employed in business [12].

Observing and noticing require letting go of assumptions and looking at objects, people, and situations from multiple perspectives. While business students are often taught to rely on critical and analytical methods for observing and noticing [27], in arts education, students often learn how to see the world through a variety of senses, mediums, and perspectives [28]. Physical interaction with the concrete world, emphasized in both theater and art practice, is a way to critically engage with it [26]. Movement, as taught through theater and dance, is core to sensemaking and considered an important element of cognition [25].

Observing and noticing can be developed at both the individual and the team levels [25]. The challenge for teams is that as social complexity increases, individuals on the team shift from perceptually-based knowing to categorically-based knowing to make coordination and communication simpler. Imagine, for example, writing an entire paper without using any conjugation of “to be”. Rather than describe someone as drunk, for example, thicker description of the person’s appearance or behavior would be required, moving closer to the concrete experience of the person [1]. Arts-based projective techniques are one means of engaging a team in conversation such that intellectual and emotional connection to a topic at hand are retained [29], facilitating better sensemaking.

Framing and reframing happen at the intersection of reflective observation and abstract conceptualization and are tightly intertwined with *observing and noticing*. There are three intersecting means of making sense of the barrage of physical, social and symbolic stimuli in a complex environment. First, as individuals, we interpret stimuli based upon our own experiences and personal mythologies, and then project our interpretations onto the world. Because this is usually unconsciously done, it often reflects more about us than about the broader world. The second approach, practiced widely in the business world, invokes science and analytic reasoning in which stimuli are reduced to numbers

and then to trends and causal relationships upon which action can be taken. The third approach characterizes art-based sensemaking in which careful attention is paid to stimuli by listening deeply with the whole self for meaning. That meaning is then represented in an artistic form that retains and represents the essence of the complexity of the original environment [10]. This representation provides a more nuanced view of the differences between business and arts-based approaches and implies both the possibilities and challenges of helping students learn to integrate them. The ability to retain the essence of complexity while anchoring in a problem frame is critical to teams as they move to the problem-solving half of the innovation cycle.

Imagining and designing happen at the intersection of abstract conceptualization and active experimentation and often in a highly iterative fashion with *making and experimenting* as individuals or teams come up with ideas and then bring them alive. In the business sphere, “managers need creativity interventions that avoid both the risk of premature closure (myopia) as well as unlimited opening up (confusion), that balance an orientation to exploitation with exploration, as well as foolishness with reason” [30] (p. 355). There is a tendency in business classes to praise imaginative processes that preference the use of language and abstraction while in arts-based classes there is a tendency to praise students who can visualize ideas easily and readily manifest them in material forms. A wide range of arts-based tools for imagining and designing engage the entire self in envisioning alternative futures [31,32]. By *imagining and designing* across disciplinary boundaries in *Collaborative Innovation*, students learn to see how their peers think and then how and when different approaches to *imagining and designing* make sense.

Making and experimenting happen at the intersection of active experimentation and concrete experience. In this quadrant, the concepts conceived in *imagining and designing* are brought alive and shared with others to generate reactions. In groups of business people, there can be deep-seated resistance to engaging in art forms in which they believe they have limited ability, and it can be hard to engage them in making [29]. The ability to bring concepts alive benefits businesses not only in letting them test ideas with potential customers, but also in learning more about themselves as an organization [33]. There are many methods for bringing ideas alive that are often associated with new product or service design and development [34]. A variety of modes of experimentation are finding their way into business as well [35], although the notion of failure continues to be challenging [36]. Arts-based students, on the other hand, are afforded leeway to experiment, test, hack, break, and speculate about alternative modes of being. In art-based disciplines, “. . . a student’s job is to test assumptions, make mistakes, and question everything, free from the confines of corporate or institutional protocol. Being a student demands humility and assurance that one’s work can founder or collapse without an impact on the bottom line” [37] (p. 35).

The discipline-independent learning process represented by this framework facilitated conversations about the different mindsets, skillsets and toolsets each discipline brought to the class and allowed faculty to discuss differences both among themselves and openly with students, while at the same time having a shared baseline. This in turn opened opportunities for students to explicitly identify their own preferences for how to engage with the innovation cycle, and to have meaningful conversations with their teammates about their differences and how they might usefully be reconciled to achieve their shared project outcomes. Each of the six innovation activities in which the students participated during the semester led the students through this innovation cycle or learning process, and students were encouraged to regularly reflect on where they were in the cycle as a team, and where they thought they needed to go next. This allowed for explicit attention to problem framing and solving approaches and thus to mindset, skillset and toolset development among the students.

2.2.2. Inner, Other, Outer

The second framework the course faculty found useful in integrating the three disciplines identifies three modes of attention employed by successful leaders: inner, other and outer focus [38]. *Inner focus* entails paying careful attention to internal physiological signals that inform understanding

of the self and employing cognitive control which permits pursuing goals despite setbacks and distractions. *Other focus* develops cognitive and emotional empathy for others and social sensitivity to identify what others need. *Outer focus* drives exploration of the broader system in which one works, often facilitating discovery of unexpected connections.

Inner focus appears often in descriptions of the integration of arts and business curricula. College “is a prime moment for students, including many older students, to question and redefine their core sense of who they are” [39] (p. 4). A frequently-mentioned benefit of integrated courses is that they allow students to explore themselves as individuals including their personalities, aspirations, and contemplation of their callings [2]. Reflection on experiences helps students connect to their academic work, what they are learning about themselves and others, and what they would like to learn in the future [40]. Arts-based projective techniques and making, using a variety of art forms [32,33], are an effective means of exploration and discovery about self as well as about others [29].

Much of the exploration of inner came through exercises run by theater/dance and art practice faculty, perhaps due to the “making” nature of both disciplines. “The premise underneath the making process is that the act of making art can foster a deep experience of personal presence and connection. . . . [this can] help to develop a sense of personal authenticity that can be the foundation of authentic leadership” [29] (p. 64). The business representation of inner focus was more abstract—words describing the brain science of self-awareness [38], and was less easily internalized and immediately practiced by students.

Other focus appears in the business literature around developing empathy for customers (e.g., [41]), largely through observation and interviewing [42,43], and developing relationships with colleagues [44]. In the arts, other focus is explicitly developed through projective techniques as well as illustration of essence using artifacts that embody universally recognized qualities, situations or ways of being to which people can relate personally [29]. Understanding of a student’s own inner experience is crucial to allowing them to question and empathize with the inner experience of others (other focus). Without focus on the other’s inner experience, innovation can lead to inappropriate and potentially even harmful effects. “Audiences are never ‘others’—they are always very concrete selves” [19] (p. 23).

In *Collaborative Innovation*, students toggled regularly between inner and other focus as a means of learning about both themselves and their peers. In part, this was facilitated by explicit focus by faculty on developing teaming [44] capabilities among the students. Students started their projects with conversations about shared goals, roles, team process and how they could meaningfully leverage the diversity in experiences present on their teams. They checked in periodically on these topics and made needed adjustments on the longer projects. Teaming assessments administered at the end of each project allowed students to make real-time changes to their individual behaviors as well as to their team interactions.

As complexity increases, systems understanding and creation of fluid, networked organizations will become increasingly important thus making *outer focus* particularly relevant today. Adaptability, resilience and tolerance for both uncertainty and ambiguity are required to live and work in a world of complexity [45]. A rich business literature on systems modeling provides analytical approaches to mapping the interactions among entities in a system, including simulating systems dynamics [46,47] as a means of developing outer focus. Socially Engaged Art positions itself at the nexus of these complexities by offering disciplinary flexibility to navigate the contradictory needs and experiences of our contemporary moment. In particular, “socially engaged art functions by attaching itself to subjects and problems that normally belong to other disciplines, moving them temporarily into a space of ambiguity. It is this temporary snatching away of subjects into the realm of art-making that brings new insights to a particular problem or condition and in turn makes it visible to other disciplines” [19] (p. 5).

Other focus was brought alive for students in *Collaborative Innovation* primarily through the problems they tackled in their team projects. Starting with the Art Practice project, students took on meaty and challenging issues such as drug abuse, sexual assault and loneliness that forced them, through research and discussions with others in and outside of the class, to examine the dynamics

of the systems surrounding these issues. They learned various approaches to modeling systems, identifying the enablers and inhibitors of change in those systems, that allowed them to bring the problem space alive, create meaningful discussions around the space, and ultimately to imagine ways in which they might intervene in the system to make change.

The course faculty found development of inner, other and outer focus a compelling means of presenting materials to the students in *Collaborative Innovation*, of integrating elements of each practice, and of integrating across practices. In theater, dance and performance, for example, inner–other–outer balance plays an important role in character development, storytelling, stage blocking and choreographic choices, and bodily expression. Thus, as students learned the basics of constructing a performance, they physically enacted both the innovation cycle and the experience of inner, other and outer focus. In their art practice work, they captured the complexity of significant societal problems in physical artifacts that generated thoughtful discussion. In business design, they embedded understanding of others in product and business model (systems) design.

After using the two models independently for a couple of years, the course faculty recognized the deep relationship between them, as depicted in Figure 2. Applying the innovation cycle to development of inner focus allowed students to observe themselves, reframe mental models they held about themselves, imagine new ways of being, and then test those new ways on others. An other-focused innovation cycle maps best to human-centered design (or what is popularly called design thinking today) in which others, such as customers or users, are observed, insights are garnered to frame an opportunity to help those others, solutions are imagined and then prototypes are built to test the ideas. Outer-focused innovation leverages an understanding of complex systems and institutions often providing context for design for inner and other.

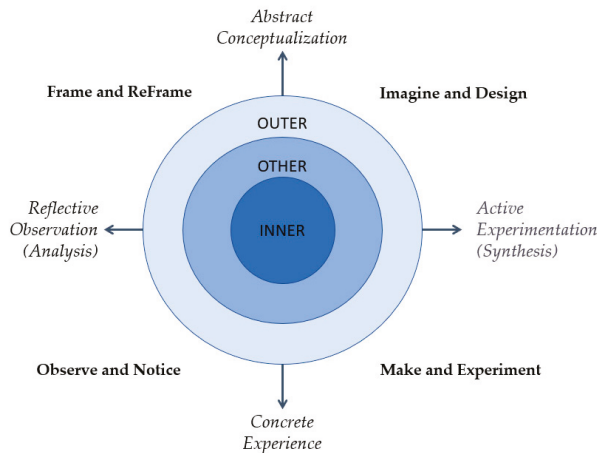


Figure 2. Inner–outer–other and the innovation cycle.

The interactions among inner–other–outer played out throughout the semester in *Collaborative Innovation*. Students start the semester by introducing themselves in an online discussion format, sharing where they come from, experiences that have been important to them in their lives, what they are passionate about and anything else they think might interest their classmates. These personal introductions, even though online and in a class of more than seventy students, set the stage for deep interpersonal engagement and learning throughout the semester. Students subsequently share an object that means something to them, identify issues about which they are passionate, write about where they come from, and finally reflect on their learning from their initial introductions to the end of the class. As they move through the materials, they observe and notice themselves, frame and reframe where they see their fit in the world, imagine new ways of positioning themselves and experiment, often during in-class presentations, with those new positions.

An important learning for the course faculty was the importance of the interactions among inner, other and outer for student development and personal growth. For example, students explored themes related to their inner experiences and world-views through facilitated constructive interactions with others and ultimately the creation of a dance/theater performance and an art sculpture. Through these creative explorations, made in diverse teams engaging with each other's experiences and personal stories, students developed a better sense of the outer world. Thus, it became clear that the innovation cycle provided the basic tools and structure and was brought alive for the students as they toggled among inner, other and outer foci in an iterative process moving through the innovation cycle. This learning is represented in the following analysis of student reflections about the class.

3. Student Reflections on Learning from Course

3.1. Data Sources and Analysis Methods

The empirical exploration represented below in the form of quotes from students in the Spring 2018 *Collaborative Innovation* class (indicated in the text in the form (CI, xx) where xx is the number of the student response) is in response to the following assignment:

Reflection assignment: This assignment provides you an opportunity to focus on and root into your own journey through *Collaborative Innovation* this semester. Write a reflection on your journey starting with reviews of your prior work: Look at your earliest writings and responses to initial exercises, particularly your first discussion of who you are and what you wanted to get out of the class. Then re-read your "coming from where I'm from" writings. Write a paragraph in response to the prompt: "on this part of my journey, I learned this about myself . . . ". Then add a one-paragraph assessment of your experience with your classmates in the teams you worked with this term reflecting on: the pairings, groupings and final group, the interactions, transactions and conversations, what you learned most about yourself from others, what you learned most about others. Close with one sentence describing what the word innovation means to you now that you have taken this class.

Students in Spring 2018 submitted this assignment after the final showcase of the semester. Of the seventy-four students in the class, sixty-five submitted usable papers; seven students failed to complete the assignment and two were in file formats that were unreadable. We collected the reflection papers and de-identified them, removing names of individuals and teams. We then assigned three people to code the papers [48,49]. In the first round of coding, we asked each person to highlight the items they found interesting in the reflection papers. The team met, discussed similarities and differences in the items highlighted, and clustered the highlighted materials.

The results of that analysis are captured in the following three sections highlighting the themes identified in the coding: (1) internalizing inner-other-outer; (2) teaming at the heart; and (3) transformation through iteration. They reflect an overall sense that the students learned to toggle between their personal and team explorations as they iterated through the six team-based applications of the innovation cycle. They fluidly moved among inner and other in each of the phases, developing and then pursuing a shared passion to make a difference in the outer world. In their words at the end of the term, "Innovation means the unique and creative process that occurs when converging mindsets and experiences from all different fields of study to solve the wicked problems of the world" (CI, 31). Parallel constructions show up in the academic literature: "Leadership relies on three very different types of courage: the courage to see reality as it actually is, and not as others would have us see it; the courage to envision previously unimagined and unimaginable possibilities; and the courage to inspire others to bring possibility back to reality" [3]. As one of the students put it: "... innovation ... means bringing purpose to my identity, as well as thinking fearlessly with others who are similarly fearless" (CI, 45).

3.2. Internalizing Inner–Other–Outer

Student reflections emphasized the inner–other–outer framework extensively, including in their definitions of innovation: “Innovation: The process of puzzling together one’s personal background, true passions, excitement, and belief in a greater world while working with others to create something unique” (CI, 64). They described understanding and sharing of the inner to develop relationships with others: “The more of my inner [that] is visible the more others are willing to share about their inner” (CI, 11). In the other direction, they described the extent to which others helped them discover their inner: “. . . I was able to have a lot of very interesting conversations about everything from education to passions to dreams. These conversations inspired me to think more critically about my own path in life and made me more aware of the things I want to do after graduation” (CI, 20).

Inner and outer focus were also tightly connected for students in *Collaborative Innovation*. “Understanding my inner, outer and other stood out as important both for inside and outside of the class. The dialogue between my own body and the world around me was surprisingly also very artistic. . . . *Collaborative Innovation* has taught me to redefine creative expression and to learn from the outside world” (CI, 53). Throughout the course, students identified issues that they cared strongly about, which ultimately drove the formation of their final project teams. Students were able to draw upon their own strongly felt concerns, find others who shared similar concerns, and build artifacts that helped them and others outside their teams process those concerns leveraging the use of art-based projective techniques and drawing upon illustrations of essence [29].

Students made connections among inner, other and outer in their reflections that went far beyond notions that were explicitly presented to them in the class. The setting, creation of a safe space and extensive opportunity to interact with a wide range of individuals through the six team projects seem to have provided them with the space needed to explore and develop these capabilities.

3.3. Teaming at the Heart

Collaboration was explicitly taught in the course through a teaming [44] curriculum (explicated on teamingxdesign.com) that had students share individual profiles with one another as a launching point for their project work together, and gave them regular peer feedback to learn about and improve their interactions on the team. Teaming [50] was at the heart of learning for the students, and they described this class as unique in their university experience in the ways in which it developed their teaming skills. “I realize that I had a very different expectation of the class from what I now have. In the beginning, I thought that this would be a class that would make us focus on group projects in a sort of traditional way; some of us would end up doing most of the work, our topics would get picked for us, and we were to focus on the group . . . rather than developing ourselves as well. . . . after taking the class, I realize . . . the growth I have undergone thanks to working with a group of people” (CI, 50). In addition, many of them said that they “. . . got to make some really great friends” (CI, 30) in the class.

Engagement in teams was critical in forcing some students out of their comfort zones, while allowing others to shine. “Sometimes it is best to let people gravitate towards their talents and work with their unique abilities, and other times it is beneficial to encourage group members to step outside of their comfort zone and stretch their abilities to create balance among the group and have each individual member grow as much as possible” (CI, 61). These opportunities were made apparent through the three discipline-focused modules: “. . . on the dance module portion . . . I learned that I rely on mental-visual images of movement during my creative process, which allowed me to adjust my working style” (CI, 41). They gave students a view into the contributions they could make outside their major: “Because I am mainly a dancer, choreographer and performer, I was afraid that I wouldn’t have much to offer since the class didn’t necessarily revolve around dancing. However, I discovered that the creativity and innovation that I put into dance could also be incorporated to so many other aspects of group projects . . . ” (CI, 59).

Diversity on the teams provided an experience students sought at the beginning of the semester. “... I had never seen such diversity in one class since I came to Berkeley. There were people of different genders, sexual orientations, ethnicities and personalities. ... in college it was difficult to find diversity because similar people tend to gather into friend groups based on interests. It felt very freeing” (CI, 58). Diversity was crucial to the functioning of the teams, as it provided the variety of perspectives [18] needed to innovate. “The best teams should challenge one another, offer diverse perspectives, and maintain a fun working environment for the best outcomes” (CI, 4).

As one means of understanding diversity, students frequently mentioned the importance of knowing their learning styles, which are associated with the four quadrants of the innovation cycle [23]. Figure 3 shows the learning styles associated with the cycle and the breakdown of learning styles for the Spring 2018 cohort whose reflection papers were analyzed. (Note that the number of converging learners, who are very good at finding answers to problems and do well on standardized tests, is approximately 50% in business student populations [51], but is only 39% for this cross-disciplinary population.) Students found knowledge of their own learning style valuable: “I found out that I was an accommodator. This solidified my knowledge of myself as a manager/facilitator and made me take a more active role in using this component of my personality in the final project” (CI, 13). They found it helpful to know the learning styles of their teammates as well. “... we all can be classified as a specific type of learner, and we should keep in mind what other learning styles we should look for in collaboration” (CI, 14).

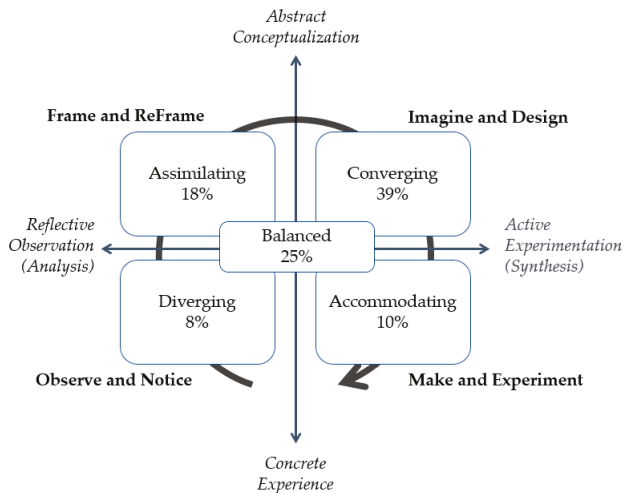


Figure 3. Learning styles for spring 2018 Collaborative Innovation cohort.

Diversity also sets up conflicts that, if not managed well, can lead to team dysfunction and reduce team outputs [52]. Students highlighted communication and active listening as the way they overcame conflicts. In many cases, good team communications in their minds depended first on their ability to see themselves more clearly which allowed them to listen better to others. It also depended on them being able to accept others’ perspectives. “I used to prioritize my opinions [over] others and did not value their ideas as much as I should have. ... the process of sharing and exchanging ideas made me realize how important it is to accept other people’s ideas because I learned that my idea is not always the greatest” (CI, 5).

Students also highlighted learning that teams can be very different from one another in how they function, and still be successful. Several learned that they needed to be more flexible in the roles they took on in any given team, as the diversity of experiences on the team, the focus of the team’s

work and the need for their own skillsets varied. “In working with others, I discovered that true diversity means that every group interaction will be quite different and people will always respond and react in different ways. Within those group contexts, I have a responsibility to both be true to who I am and also to support my team, which sometimes requires compromise if my own goals are not initially aligned with those of my team” (CI, 35). For many, this was surprising, as they had imagined themselves as playing very specific roles on teams in the past. “I learned to change my approach while working with different kinds of people, to best utilize our individual strengths” (CI, 55).

Ultimately, developing trust was core to the students’ team experiences. Some credited the class with creating “a safe and supportive community, largely through . . . discussion forums. It felt like . . . we were more than a class . . . we were an experience living itself” (CI, 16). Others acknowledged “I learned what it means to be open and vulnerable, and how to candidly express my story, to complete strangers. I learned how to listen and absorb the stories of others. And, most importantly, I learned how crucial having trust in others is in this process of creation” (CI, 7). This development of trust proves to be crucial to allow innovation in the creative process. “Inviting possibilities demands a great deal of trust in the uncertainty of the creative process, even though giving oneself over to uncertainty seems like an unlikely goal” [37] (p. 35).

Leadership was also a constant theme throughout the reflections, even as it was ill-defined. Many of the students who wrote reflections talked about their role as a leader, which means that there were more leaders in the class at any given time than there were teams. In part this was due to the realization that they could be a leader of a part of the innovation process: “I realized my strength as a leader in the diverging process, and how I needed a converging leader to complete my skills on a team” (CI, 7). One student reluctantly took on a leadership role upon finding that he was the one forming the ideas for the team’s final project and despite hesitations declared that “I learned more about myself during this part of my journey than any other period of my college career” (CI, 12). In a similar vein, others began taking on a leadership mantle upon hearing from their teammates that they were viewed as having leadership capabilities.

3.4. Transformation Through Iteration

The four quadrants of the innovation cycle appear less obviously in the student reflections than the inner–other–outer construct does. One reason for fewer explicit references to the innovation cycle could be that the inner–other–outer framework was mentioned indirectly in the assignment instructions, while the innovation cycle was not, which could be changed in upcoming offerings. There is a further opportunity, however, to build the innovation cycle more visibly into the final project by requesting that students formally and regularly reflect on where they are in the cycle, and where they would like to go next. The course faculty change each year as well, and some more directly integrate the innovation cycle into their own materials than others. As new faculty are integrated into the course in upcoming years, there is an opportunity to have them more explicitly integrate the innovation cycle, at the same time refreshing discussions about what frameworks best represent the work done together, and how those frameworks might be evolved in future offerings.

Nonetheless, students mentioned several specific skills and tools taught in each of the innovation cycle quadrants. The critical balance between diverging and converging (*imagining and designing*) was noted by a few: “. . . my biggest takeaway is that I learned how to diverge. As someone who prefers structure and stability, I realized I am quick to converge and create a tangible solution. I always considered the idea of diverging, especially once an idea has been chosen . . . as ‘going off track’ . . . which is never a good thing” (CI, 9). Some came to gain “great respect for narratives. Hearing someone’s story, told in their voice and through their eyes . . . ” (CI, 38) was a means of *observing and noticing* and *framing and reframing*. Others saw the value of narrative (*making and experimenting*) in achieving their dreams: “I realize a good business plan and model is all about a passionate story. If I want my small start-up idea to succeed I need to dig into where I come from and create a compelling story that can help develop, support and sell my idea” (CI, 64).

Critique, a mechanism used primarily in the arts to give and get feedback, surfaced importantly in the reflections. Working through team difficulties was facilitated by “learning how to critique and receive critique constructively . . . ” (CI, 25). In this class, critique functions as a framework in which to clarify both the intentions of a group and how effectively they were able to convey these intentions to those outside the group. It consists of a formalized process of inquiry, guided by questioning such aspects as motivation, the reason for specific formal choices, and how the group might change their process in the future. This framework allows students to get to the core of their choices and responses and to elicit deeper engagement than their initial understanding and decision-making led them to. As Christina Bertoni, Professor at Rhode Island School of Design says, “I think of critique as an articulation exercise, a way to get people to consider rather than judge” [37] (p. 214). In addition to feedback on the outputs of each of the team efforts, students were given the opportunity to give feedback to and get feedback from their teammates describing both the contribution they made to the team and opportunities to improve. Because of this feedback, for example, one student worked to improve his ability to balance listening and advocating as he moved among various teams.

The most common observation students made about the innovation cycle addressed the highly iterative nature of the innovation process. “Sometimes you need to just let ideas settle in and marinate” (CI, 3), one said and “Learning isn’t about optimality, but rather trying, trying and trying again” (CI, 54). “Innovation . . . is a continuous evolution of ideas, obstacles, and further enhanced ideas. It is the best part of the human experience, because the process is like that of reaching a fulfilling life” (CI, 40). While they liked the notion that they should “trust in the process” which “takes a lot of stress off of me” (CI, 32), they appreciated the malleable nature of the process and their role in making the process work for them. “I’ve learned that innovation is a result of many iterations and discussions” (CI, 29) and requires “the willingness to embrace challenges and the ability to recognize existent deficiencies while transferring ideas/inspirations into perceptible forms” (CI, 31). Through their experience, they “learned to become more mindful of the process itself, which naturally forced me to reflect on my strengths and shortcomings to cycle myself back into upward self-growth” (CI, 40).

3.5. Experience-Based Learning to Become

For the *Collaborative Innovation* faculty, the magic of the class as represented in the student reflections—the deep learning about inner–other–outer, teaming with heart, and transformation through iteration—would not have been possible without the integration of the three disciplines not only by the faculty, but by the students in their experiences with one another. With faculty facilitation and strong frameworks to anchor their exploration, students found their own ways of internalizing the learning, and ultimately of seeing the ways in which they might become [14] contributing professionals in the rapidly changing world. In the process, they gained capabilities in both collaboration and innovation, thus—possibly—collectively defining a new profession: collaborative innovator.

Students in *Collaborative Innovation* clearly saw different possibilities for their own direction and development after the class: One of the prospective business students in the class, for example, declared “Before, I wanted to just work for a large consulting firm; conform to their mission statements and lead others using old techniques and philosophies. But after taking this class, that just sounds boring!” (CI, 64). Another said “The very most impressive thing I learned about myself in this class—or I would even rather say developed—is the awareness that I do not just want to stress out about having a perfect career and getting . . . promotions and money and all that stuff but rather that I want to focus on myself more as well as my environment” (CI, 65). She changed her focus from getting a job in Mergers and Acquisitions at Goldman Sachs to considering a Corporate Social Responsibility position in a company she “can relate to”. The class, she said “definitely left a lot to think about and the process hasn’t ended yet”.

From the perspective of the arts disciplines, a dance student declared “I feel more secure pursuing dance because I have gained knowledge outside of performing. Moreover, what I realized is that it’s not so much having hard and fast business classes that make me feel more secure, but rather knowing I have valued skills other than just performance skills. The ability to work in a group and

facilitate creative ideas to realization is an incredibly practical and highly valued skill. . . . Going into this class I assumed my ideas would not be valuable because I am a performance major. I did not see how I could contribute to projects with lofty, abstract ideas. I think my biggest takeaway from this class is that my creativity can be of value in a practical sense" (CI, 2).

The disciplinary diversity in the class clearly opened windows of possibility for students. A chemistry student, for example, was taken by the "theater frame of focusing on social justice" (CI, 10) while a humanities major responded that "The biology and chemistry majors taught me about the research-oriented process of testing and validating hypotheses. I know now how to leverage such diversity within the context of [the] innovative cycle" (CI, 40). Thus, while the class started with a simple definition of inner as self-awareness, in ways that surprised the faculty to some degree, it took on a much deeper mission: providing a sense of new possibilities and a transformative experience for students.

While much of the curriculum was designed by faculty before coming to the class, and the frameworks leveraged for the class are based on existing theory, the elements came together in surprising ways and had a much more profound effect on the students than expected. Much of this seems to be due to the creation of a safe space in which students from highly diverse backgrounds were able to come together to tackle complex problems. The intensity of a six-hour per week in-class format allowed for rapid iteration through project work to start, exposing students quickly to a wide range of people and approaches. This provided them the comfort needed to explore diverse perspectives, approaches and solutions in depth during the final project, and ultimately the opportunity to examine their own possible contributions to the broader world.

4. Conclusions

The opening of the paper describes accelerated change in the world, and the resulting possibility that professions as we know them today will have to evolve, change and potentially be entirely redefined. Professionals in the future will need to be highly adaptable to change, uncertainty, and complexity. To be impactful in their fields, they will have to be sensitive and flexible in framing and solving problems. And, they will have to be able to do so while teaming with a diverse population of others. In short, future professionals will have to be adept at "becoming". Dall'alba [14] draws on philosopher Martin Heidegger's notion that being human means having possibilities or possible ways to be, and thus that we are all in a perpetual process of becoming. Ultimately, she argues, education is about transformation of the self.

Student reactions to *Collaborative Innovation* bring alive their experience of that transformation, their experience of the journey through the ambiguities associated with the evolution of and constraints on possibilities, and their learning about the need to balance openness versus resistance to change. "Getting to learn by doing and work in teams solving real and important issues really brought me back in touch with what I want to do in the world. It has felt like a transformational semester in which I am now shifting my focus and priority to . . . pursue the work of design, teaming and problem solving as a career" (CI, 62). " . . . job satisfaction will come from wearing many hats with a mission that requires deep thinking and multiple variables" (CI, 10).

The class provided them with fluency in a set of approaches they can use in an ongoing "becoming" process. Using models such as the innovation cycle will allow them to leverage a wide range of mindsets, skillsets and toolsets as they try to understand and respond to problems. They can leverage understanding of inner, outer, other focus, constantly iterating among them to adjust and adapt their focus as the environment in which they are working evolves. The transformative experiences in this class would not have been possible without integrating the perspectives of multiple disciplines—both from a content and faculty perspective, as well as from a student diversity perspective. These processes and perspectives allow students to simultaneously experience personal transformation and transform their fields of influence in ways that align with their deeply held values. As these newly minted "collaborative innovators" continue their transformation journeys, teaching or involving others as they go, perhaps they will design a new profession as well.

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Article

An Organizational Perspective on ArtScience Collaboration: Opportunities and Challenges of Platforms to Collaborate with Artists

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Abstract: Artists are often seen as innovators and producers of creative and extraordinary new ideas. Additionally, experiencing art and artistic processes is an important opportunity for learning and exploration. Thus, corporations and scientific organizations have experimented with initiatives that generate artscience collaboration, such as fellowships, long-term collaborations with artists, and artist-in-residence programs. Looking at outcome in the long-term, it is possible to identify important contribution to scientific, technological, and artistic fields that stem from artscience collaboration opportunities in organizations. On the other hand, it is often difficult to define immediate tangible outcome of such processes as innovation as interdisciplinary interaction and learning processes are valuable experiences that do not always manifest directly in outcome that can be measured. Drawing from cases of artscience programs and qualitative interviews with program managers, scientists, and artists, this article explores how artscience collaboration in an organization adds value and helps overcome organizational challenges regardless of such outcome. By shifting the focus from the outcome to the process of artscience collaboration, it is possible to discover in more depth value-added contribution of artscience experiences on an individual level (e.g., new ways of knowing and thinking, understanding of materials and processes, and learning). Moreover, such contribution tell stories of connecting the process of artscience programs to the organizations' goals of developing a new generation of leaders and driving a more adaptive, innovative culture. These benefits of artscience opportunities need to be supported by managerial activities in the organization. Thus, it enables a more differentiated understanding of possible contribution of artscience collaboration to organizations and helps to define the best model to create such opportunities. The article also recommends future research directions to further advance artscience collaboration, especially in light of pertinent movements such as STEAM and Open Innovation, and promising developments in related fields such as neuro-aesthetics.

Keywords: artscience collaboration; artist-in-residence; artist residency program; arts-based initiatives; artscience; interdisciplinary collaboration; art and technology; art and innovation

1. Introduction

Just like society and individuals, organizations today are confronted with global challenges from climate change to digitization in private, public, and work life, from antibiotic resistance to microplastics in the food chain and growing waste problems, from widening income disparity to the paradox between an interconnected world and the rising forces of nationalism. Organizations are searching for ways to address these issues and provide solutions. They also have to face additional challenges of competition from rapid developments in or even outside their fields, often posing threat of obsolescence. They need

to keep the ever-increasing pace of developments in technology and digitization, while encumbered by legacy systems, existing structures and outdated mode of decision-making. They need to invest in new opportunities and create spaces for innovation. Moreover, they need to identify and internalize new approaches in order to adapt their culture, structure, and management systems to external changes.

Arts-based initiatives (ABI) or artistic interventions in general have been brought into organizational (especially corporate) contexts to address these challenges named above. ABIs have been investigated by management and organization scholars throughout the last two decades, as interventions and initiatives on all organizational levels in order to add value and create change, in areas including product development, human resources, learning processes, and organizational development [1–5]. Various theoretical angles have been used to analyze ABIs and their effects in organizations (e.g., [6–8]). Various forms of ABIs have been explored in organizational settings: it is possible to bring in the artwork, bring in the artist for direct collaboration or as consultant, or learn from and employ the artistic process [9].

One approach to bring artists into organizations is artist-in-residence opportunities. In such programs, artists are invited into organizations to spend a certain amount of time working there. These periods can be short-term for a few weeks or long-term for a few months up to a year. Especially in long-term residencies, artists are often not expected to be in the organization on a daily basis, and the intensity of collaboration can vary in different phases: there can be phases when the artist spends time at his/her own atelier or on other projects, while there are other phases of intense collaboration and joint project development. The roles of the artists in residence also vary: sometimes their presence is connected to specific projects or departments; sometimes they are collaborating with individual employees for a long period; sometimes they give workshops; yet other times they aim to produce an artwork. These residency opportunities are created to open a space for an ABI that goes beyond consultancy or single workshops with an artist. It allows for conversations, collaboration and ongoing exchange. In most artist-in-residence programs in organizational contexts, the artist is more than a resident who learns and gets access to the experience and opportunities at this new place, but also one who co-creates and collaborates and thus induces learning and change in the host organization as well [10]. Thus, artist-in-residence programs are an ideal means to foster processes and collaborations on pressing topics, innovation, and organizational challenges and often take place within the setting of research, development, and science [11].

As interdisciplinary approaches are essential to tackling complex problems [12], opportunities that facilitate arts/science collaboration and bring in artistic perspectives relating to society and culture can play a vital role in addressing the challenges organizations are confronted with. The resulting interaction between artists and organizational employees from diverse disciplinary backgrounds—scientists, engineers, and managers—is understood as an important contribution to fostering individual creativity, new insights, and new perspectives on issues within organizational or scientific fields [13]. As a systematic way to enable these interactions, artist-in-residence programs are gaining popularity among both governments and organizations, which invest in these opportunities [14–17] and integrate them in the organizational structure [10]. Among the most notable examples, the STARTS (Science + Technology + Arts) initiative funded by the European Commission is an important first pan-Europe governmental step to support such interdisciplinary actions. STARTS funded programs include: the STARTS Prize that has been awarded to innovative projects at the intersection of art, science, technology, and society yearly since 2016 [18], the Vertigo project that aims to support and fund at least 45 arts/science residencies and is developing a web platform [19], and the FEAT (Future Emerging Art and Technology) activity [20] that provides opportunities for different residency formats in the field of emerging technologies.

1.1. The Emergence of Arts/science Interaction through Artist-in-Residence Programs

Residency of artists in organizations, especially in their research and development (short: R&D) laboratories or departments, as a mechanism for experimentation and interdisciplinary exchange

began to draw a lot of attention over half a century ago. In the late 1960s engineer Billy Klüver initiated a program called *Experiments in Art and Technology* (short: E.A.T.) for collaborations between artists and engineers at Bell Labs (then AT&T Bell Telephone Laboratories, now Nokia Bell Labs) [21]. This program was preceded by a pioneering collaboration on sound in the early 1930s, and by residence of individual artists at Bell Labs in the 1950s. Maurice Tuchman, curator at the *Los Angeles County Museum of Art* (LACMA), developed the *Art & Technology Program* that provided residencies for artists in industrial corporations starting in 1970 [22]. These two residency programs focused mainly on interdisciplinary exchange, providing artists with access to up and coming technologies and industrial applications while creating spaces of exploration for artists, scientists, and engineers alike [23]. In 1965, artists John Latham and Barbara Steveni conceived the *Artist Placement Group* (short: APG) in London. The program aimed at creating change in (corporate and governmental) organizations through “artist placements”, which resembled residencies. The idea was to bring artists into organizations focusing on the artistic process inducing change, as opposed to an outcome-oriented strategy. Influenced by ideas of chaos theory, cybernetics, and system theory, Latham theorized a “butterfly effect”, meaning that the presence of an artist in such an organization will automatically lead to change in a non-pre-determined way [24,25].

Although leaders in the arts and technology movement and artists of the APG were articulate about their aims and theoretical ideas of how and why these residencies would be beneficial to artists, scientists, and engineers [22,26,27] alike, and how the process would evolve and affect fields and organizations, it was difficult to get the residencies going. Most residency programs went dormant in the late 1970s due to lack of tangible outcome in terms of contribution to the hosting organizations or immediately visible change processes [24]. Nevertheless, scientific organizations, especially universities in the U.S.A., became interested in the idea of arts/science collaboration, and important centers for interdisciplinary collaborations between artists, engineers, and scientists developed. These included early programs at University of Illinois, Ohio State University, New York University, and the Massachusetts Institute of Technology (MIT) [28]; and over the course of the following decades, MIT Media Lab, in particular, developed as a leading group in the field of arts/science collaboration. Additionally, an interdisciplinary academic discussion between art and technology in the journal *Leonardo* emerged. However, as the hybrid outcome of such collaborations are interdisciplinary and thus not strictly classifiable in art, science, or technology, and thus the tangible outcome for engineers was difficult to demonstrate; and the emerging media art as well as other technology art were difficult to contextualize in contemporary art, the movement experienced difficulties to spread [28,29].

In the 1980s organizational studies and business scholars finally started to explore the opportunities of art in organizations. The *Standing Conference on Organizational Symbolism* in 1985 in Antibes, France triggered the first batch of publications on the topic, which influenced the development of the field of organizational aesthetics (e.g., [30–32]). The interdisciplinary symposium on art and economy at the *2nd Buchberger Kunstgespräche* took place in Austria in 1986 [33]. Additionally, at the Venice Biennale in the mid-1980s an interest in art and science emerged, represented in a large percentage by computer art and thus exposing the topic to a wider audience. When the personal computer became available to a broader community in the 1990s, it again spurred increased interest in the junction of art and technology within the arts community as well as among the general public [28].

The possibility of cross-fertilization between the intellectual fields of art and science, and to a large extent in upcoming technologies, was partly what led Xerox to introduce an artist-in-residence program at Xerox PARC (Palo Alto Research Center), their innovation center (the program named PAIR for PARC’s Artist-in-Residence) [34]. The idea was in recognition of insights, challenges, and new perspectives that artists can bring to the R&D process, as well as the aesthetic dimension that is produced in such innovative art pieces and the demands of artists producing these artworks. “Unusual art pieces of today can become core media models not many years from now”, says John Seely Brown [35]. Some of the experiments achieved visible realization in the 1960s, making important contribution to the use of new technologies in scientific methodologies, or creating new art forms using technical

devices [23]. Moreover, PAIR was designed as an experiment “to keep PARC both a leader in innovation and relevant to the corporation” [35]. As an experiment it was successful as it became a role model for artist-in-residence programs in corporate R&D departments and an essential example that has been referred to in management and organizational studies.

Permeating current conversations about the necessity for organizations and management to solve problems with innovative approaches, to cope with environmental change, and to keep pace with technological developments is a keen sense of urgency for innovation and creativity in economies and policies. Artist-in-residence programs that facilitate interdisciplinary interactions in R&D are a promising opportunity to create fruitful interventions [10,14]. Additionally, scientists and engineers need to look beyond the borders of their own disciplines to approach complex questions in their fields and to make their work relevant within society; and artists have a rising interest in science and technology—both as new artistic media and for their essential implications on society. These forces have fueled interest in artsience interactions from the perspectives of the individuals and society, as seen in the growth of artsience festivals and symposia around the world, in the curation of the Milan Triennale 2019 “*Broken Nature: Design Takes on Human Survival*” and Venice Biennale 2019 “*May You Live in Interesting Times*”, in funding opportunities like European Commission’s STARTS program and in the “STEM to STEAM” movement in education. (STEM stands for the subjects of Science, Technology, Engineering and Mathematics and STEAM is the abbreviation for incorporating the arts into STEM, an approach especially advocated in education in order to enable personal development and skills beyond rational and analytical thinking.) [36,37]

In his prominent articles in the journal *IEEE Spectrum* about the E.A.T. program [26,27], engineer Nilo Lindgren pointed to resulting innovation as major contribution by the interdisciplinary collaboration between artists, scientists, and engineers, and noted the possibility to change traditional ways of working in artistic, scientific and engineering fields. Both aspects have become important growth imperatives and leadership mandates in the current business environment, so these ideas find a wider audience today. Thus, interest in and realization of artist-in-residence programs grew in the last decade in diverse organizational settings.

Nevertheless, direct tangible outcome that can be claimed as innovations is still rare. Often, changes in processes and enriched creativity through experiences in artsience collaboration affect outcome after the collaboration process has finished. ABIs often occur on a personal level as part of learning processes or at interpersonal level because this is where most ABIs take place [38]. Thus, reflection on the effects of ABIs is sometimes connected to ideas of impact of encounter with the arts (personal and societal) from an art theoretical perspective [39], based on theoretical understanding of what art is and can do, whereas outcome in terms of personal learning, change, and enriching experiences are difficult to measure. Physical hybrid outputs of art and science are difficult to evaluate, and artworks produced during residency phases are often not directly relevant to the organization’s aims. Measurement was difficult even in successful previous programs which yielded directly relevant outcome in later years, for example, in the development of hybrid disciplines like computer graphics or applications of technologies beyond their original intentions [23,40]. So why should organizations continue to invest in artsience collaboration and pursue initiatives that enable these interdisciplinary encounters?

1.2. Finding an Organizational Perspective on Supporting ArtScience Collaboration

For most organizations, notions of “innovation” and “creativity” are still too vague and not specific enough to justify investment in an artsience collaboration opportunity or a program for regular artist-in-residence projects, if it is not possible to expect measurable outcome. Cases of personal development and innovative approaches through artsience experiences [13] and studies of the link between learning in artistic and scientific disciplines and individual creativity [41,42] are an important first step, but still leave open questions of relating these effects to the organizational processes and goals. Why is it important to create these opportunities within an organization and what are specific experiences of individuals in artsience collaboration that are valuable for the organization?

Additionally, residency programs must be planned carefully and integrated into the organization so that relevant effects can manifest [14]. This means that space and activities to reflect and integrate outcome afterwards need to be guaranteed. Intermediaries like agencies, curators, mediators, and program managers are central to the impact and successful incorporation of an artistic residency in an organization [10] and the artscience collaboration process [43]. Professional consultants can fill this gap, though organizations need to be able to reflect on outcome to allow potential experiences and learning from the ABI process to be internalized in the organization [44].

Drawing from research on artscience collaboration, with its relevance for both artists and scientists, and relating this to organizational needs and goals, especially innovation, will help to take a first step towards a more coherent argument for artscience collaboration in organizations, especially corporate:

- Organizations aim at hiring the best scientists and employees, keeping them motivated and providing them with structures and resources they need to do their job in the best way they can.
- Organizations want to create innovative services and products for their clients and customers, provide them with the best solutions, and make them known to their current and future customers.
- Organizations need to overcome challenges posed by fast-paced technological advances, market shifts and social changes. They need flexibility and agility, and future visions that align with their environment and stakeholders.

Above that, organizations have to cope with internal structures, processes, organizational blindness, change, and cultural issues, which are all aspects ABIs in general can potentially tackle [6]. How can artscience opportunities as specific form of ABIs be related to these issues?

Starting from experiences in laboratories and one-to-one artscience collaborations, connections will be made between individual learning processes through personal experiences in these opportunities and the organizations' needs shown above. Careful understanding and management of how the openness in artistic and scientific/research processes can be intertwined and harvested within this organizational logic, regardless of immediate tangible outcome, will help to create impactful artscience opportunities that are relevant for artists, scientists, organizations, and their stakeholders.

2. Approach and Data Base

The methodological approach to examining connections in the dynamic and open process between artists and scientists (which is designed to create something valuable for both parties in the first place) developed as follows. First, cases of artscience collaborations were researched and analyzed to understand the processes and effects of these interdisciplinary exchanges and their relevance to the participating parties. How did these interactions benefit artists and scientists and their learning processes? What do they see respectively as relevant? Additionally, as most cases take place in organizations, they were asked about their perception of how the program relates to the organization, their work in the organization, and where they encounter difficulties to realize that relevance in the organization. Program managers, curators, and facilitators were interviewed to contribute their experience and their point of view on these processes as well. An overview of the contribution of artscience projects to individual development and organizational transformation gleaned from the interviews will be presented in Section 3. These findings will then be discussed in relation to the existing literature on ABIs. Second, therefore, research on ABIs was analyzed towards an understanding of how they in general benefit organizations and what organizational theories were used to identify a better connection between the effects of ABIs and organizational needs, especially within corporations. Artscience collaborations within university settings are not so tightly bound to this kind of organizational logic because the individual benefit to the scientists engaged in artscience collaboration is in many cases more important; and individuals decide differently about engaging in artscience than organizations do. Third, cases of artscience collaboration in organizations were analyzed in order to understand the connection between individual artscience collaboration processes and related organizational benefit. Such analysis has been derived from primary research in this

project. In each of these cases interviews were conducted with different parties of the artscience project or program, followed up with official reports and presentations in other media. Five of these cases will be presented as five stories of artscience programs in Section 4 to impart insights into the model with concrete examples. Bringing all these steps together, a more comprehensive understanding from an organizational perspective will be formed to discuss managerial challenges.

The research into the impact and management of artscience collaboration draws on research Claudia Schnugg has been conducting during the past four years, including participative observation of processes and semi-structured qualitative interviews with artists, scientists, researchers, engineers, and managers (including curators and intermediaries) [45], corroborated with BeiBei Song's research and teaching in innovation and leadership, and similar interviews and curation in science and technology art. Schnugg has formally conducted 58 qualitative interviews between October 2016 and April 2018. Forty-seven interviews were digitally recorded and accompanied with handwritten notes, and nine interviews were captured in handwritten notes (further questions during transcription checked with the interviewees for clarification), whereas two interviews took place via email. Hence, two interviews took place in a written form via email, the other 56 interviews took place in person or via teleconference system, and all 58 interviews were followed by detailed descriptions of each case. Seventeen interviews took place with artists, 15 with project/program managers and curators, eight with artists experienced in artscience collaboration who later became artscience program managers, and 18 with scientists who experienced collaborations with the artists interviewed or were part of one of the artscience programs. Additional conversations about the experience took place with other contributors to artscience processes observed or managed by the authors which were captured in hand-written notes. Most of the managers, curators, and artists were involved in multiple projects whereas many of the engineers and scientists have experienced only one or two of these processes. From the interviews that represent cases or artist-in-residence programs in organizations, descriptions were written up and checked back with the interview partners. Additionally, Schnugg was following the documents and presentations about the cases and programs to develop a more comprehensive understanding of how the individual stakeholders understand what they are doing and why. The cases and programs cover corporate and scientific organizations, and interviewed individuals come from a diverse background: mostly from Europe and North America, but some also from Australia, Asia, and South America.

The cases discussed by the artists, scientists, and program managers interviewed took place in 18 different programs: at universities, scientific organizations, corporate organizations, and cultural organizations. Most interview partners could report about several artscience experiences with different partners and in diverse formal programs. Only a few of the cases described by one of the artists and two of the scientists did not take place within an artscience program, but were one-time opportunities created by the artist and scientist to collaborate with each other. Most of the cases took place as residencies with a duration of between one and twelve months. Additionally, a few long-term collaborations were created as fellowships for the artist at the laboratory or went on after a first residency phase. This myriad sampling provides a wide range of formats and helps one understand the processes and value-adds of artscience interactions from the diverse and interdisciplinary perspectives involved in such activities. Ongoing discussions of observations and experiences with curators of artscience processes and programs in organizations further stimulate the development of the ideas and interpretation of the material.

3. Value-Added of ArtScience Collaboration from an Organizational Perspective

Organizational scholars have shown that most effects of ABIs happen on the personal level through personal interaction with art or the artist. Thereby, a series of effects were identified through meta-analysis of case studies. These effects range from individual learning processes, to heightened communication skills, or new insights. Such effects then can induce changes on the interpersonal level like better communication, addressing conflicts, and sharing values; and even reach the organizational level by impacting organizational visions, change processes, and outreach. Beyond that there are

certain organizational goals that can be addressed through ABIs without their effects on an individual level. These can be organizational communication through artworks or artistic contribution that are consultative [3–5]. As a meta-analysis shows [38], previous studies also indicated that arts-based initiatives can have impact on the organization’s surroundings or create and enrich the organization’s external relationships.

Thus, starting from the individual level, the analysis of the interviews and cases points to substantial contribution relevant to organizational and managerial discussions [45], as well as innovation insights:

3.1. Personal/Interpersonal Learning and Leadership Development

- As art approaches topics and projects with processes and skills that are different from scientific disciplinary processes and skills, these collaborations can help contextualize these topics and projects and help scientists and organizational actors to understand their work differently in these contexts (contextualization), which can even induce meaning to their understanding of their work (meaningful work theory);
- The collaboration and interaction of actors from such different fields, disciplines, and environments helps to create new social and organizational networks; transform existing fields into new ones and engage the actors in them; and accumulate new connections, whether tight or loose (strong and weak ties);
- The aesthetic dimension of artscience collaboration can improve communication of concepts, contexts or phenomena through the aesthetic power of art; additionally, the interdisciplinary discourse between artists and scientists helps to build up diverse communication skills and improve personal communication;
- Collaborative processes of artists and scientists as well as artistic and scientific combination or reproductions of ideas can lead to sense-making processes and support sense-giving processes, thus help to understand different perspectives on issues or interpretation possibilities of data through new ways of thinking;
- Artscience collaboration is one form of interdisciplinary collaboration that can contribute to work processes on complex issues, support learning processes to enhance cross-functional collaboration skills and enhance problem-solving processes for complex challenges.

3.2. Organizational Learning, Innovation Process, and Cultural Transformation

- Artscience interactions can constitute liminal spaces for experimentation, serving as a tangible vessel of exploration (Exploitation vs. Exploration concept);
- Such liminal spaces can help induce or realize change, facilitating discovery of possibilities that the company’s core business would not have dreamed of;
- They can also be a platform for sensing internal and external innovation opportunities;
- The engagement of artists increases variance and divergent thinking, enhancing ideation quality and problem-solving potential;
- The interaction of art and science allows collaboration partners to experience the other profession’s approach and thus tackle dimensions of organizational aesthetics, such as getting in touch with embodied knowledge, internalized work processes, and understanding of materials;
- The artscience process induces or enables change, enhances the creative process and promotes conditions allowing individuals to be more innovative and more resourceful;
- Artscience initiatives can have a signaling effect of the organization’s culture, attracting and retaining the best talent and encouraging employees to behave with innovative mindset;
- The individual and interpersonal learning brought about by artscience collaboration may also accumulate to achieve a shared perception of “how we do things around here”, gradually changing without top-down mandate.

An interesting insight emerged from the analysis of the interviews and cases. Instead of arguing that arts/science collaboration led to an immediate creative outcome, it uncovered its effects of fostering creativity through personal learning, as well as enhancing other individual, interpersonal, and organizational factors [45] that are fundamental enablers of creativity [46]. This points to an important change in understanding the contribution of arts/science to organizational innovation and creativity: the immediate outcome of an arts/science collaboration—be it an artwork, a hybrid outcome in-between art and science, or an artistic contribution to a research project—is neither the comprehensive nor the fully representative contribution of arts/science opportunities to creativity and innovation in an organization.

Similarly, most research into ABIs has pointed towards leadership development as a key effect of ABI investment (e.g., [47,48]), with the organizations gaining important skills and abilities to cope with new scenarios and complex situations. More specifically, reflections into theoretical approaches in organizational research regarding ABIs show their effects beyond immediate outcome. These include the contribution of ABIs in sense-making and mindfulness in organizations [8]; their contribution to experiencing meaningful work [49]; their contribution to creative processes and organizational change through liminality and rites of passage [50]; and their relevance concerning materiality in learning in organizational contexts [51], organizational aesthetics [52], and embodied cognition [53–55]. Such literature already reveals the entanglement of effects on individual levels with organizational needs and goals. This indicates the value of the process between artists and organizational members as it makes essential contribution to individual and interpersonal learning, helping staff to cope with organizational challenges, navigate change and achieve organizational goals.

Not surprisingly, these effects are being validated and corroborated by discoveries of neuroscience in the areas of learning, leadership and innovation. For example, psychologists and cognitive scientists uncovering the biological processes of creativity emphasize the importance of “primary process thinking”, an unstructured, visual mental activity which can lead to “remote associations” or “long paths of association” by connecting ideas or facts that are not typically related [56]. Neuroscientists and neuro-leadership scholars have found that sudden insights, which are often the beginning of radical inventions and breakthrough solutions to difficult problems, are more likely to occur when the brain is under certain key conditions: a quiet mind, inward looking, slightly happy, and not focused directly on the problem [57–60]. Also known as an epiphany or a eureka or “Aha!” moment, an insight can be understood as “a sudden comprehension that solves a problem, reinterprets a situation, explains a joke, or resolves an ambiguous percept” [61]. By forming and manifesting new combinations of existing memories and data from the non-conscious mind, it emerges quickly into awareness instead of through linear cognitive processing. Engaging with art and learning the artistic process very much lend itself to such uncommon associations and conditions of relaxation, calmness and sensory awareness, which are conducive to creativity, innovation and leadership problem solving even when the individual is not working on a directly-relevant science, engineering or business problem.

In addition, there has been growing recognition of the power of emotions and senses in many aspects of business and organizational life: from product design and consumer purchasing decisions [62,63] to social dynamics [64] and workplace culture [65]. The brain’s capacity for perception, cognition, creativity, and collaboration decreases under emotional threat [66]. Practicing direct experience (also known as mindfulness) by being present in the moment and paying close attention to the senses helps regulate emotions [67]. Art is one of the most effective means to train one’s sensory circuitry and emotional intelligence, which contributes to workplace wellbeing internally and bolsters brand loyalty in the marketplace.

New world realities call for a new type of leader—one with a sense of meaning, flexible mindset, and a way of communicating with authenticity. The effects identified above demonstrate the power of ABIs in cultivating such leaders. As these effects and values from ABIs surface in the experience of arts/science collaboration in organizations, it is a matter of space, reflection, and integration into the organization during and after the experience [44] that relevant outcome can be harvested. These can

range from innovation to organizational culture to the organization's ability to cope with environmental change. Thereby, the individual artscience collaboration process can be as open as needed for the artistic and scientific goals to be pursued, and through careful framing of the format and integration of outcome and processes in the organizational setting important contribution can be made that go beyond effects on the individual level. The artscience programs shown below are cases where the individual logic of a valuable artscience opportunity is integrated with that of the organizational logic, enabling both to flourish.

4. Five Stories of ArtScience Programs in Organizations

The following five stories are five examples of the artscience programs investigated via interviews with several participants and parties in the projects, and additional informal conversations with the initiators and heads of the programs. The development of the programs has been followed via media and publications after the interviews. The workshops of the program presented in 4.4. also have been evaluated and participatory observation was made of the first workshop.

4.1. *Organizational Vision, Experiences, Complementary Thinking Processes, Visionary Approaches to Product Development*

Following the footsteps of the previously mentioned E.A.T. (*Experiments in Art and Technology*) program active in the 1960s and 1970s, the initiative was revived a few years ago [68]. Drawing on the rich experience of Bell Labs in the 1960s, it was immediately understood that the contribution of such a program lies beyond direct outcome of the residencies in terms of artworks or research projects, but in experiences, new perspectives, and the way artists explore ideas and address issues of contemporary society [69]. Additionally, innovative or hybrid outcome of such collaborations could become valuable only retrospectively. The head of this revived and re-designed residency program Domhnaill Hernon points out that the program is valuable for Bell Labs because artists have a special ability to make theoretical approaches and ideas observable and put them into expressive forms. This contributes to one of the organization's goals to create a new language that allows for sharing emotions. The artistic practice and artistic research process enable new ways to explore relevant research questions and to create a dialogue within the organization and with the researchers and engineers. The focus of the program is on long-term collaboration and interaction. Residency artists are invited to spend a collaborative phase at Bell Labs for twelve months, which can be extended through a commissioned realization of a proposed artwork/project afterwards.

With awareness of this potential, the E.A.T. program additionally finds an important angle to connect it with their organizational vision. Art creates experiences, is entangled with aesthetics, employs different sensory impressions, and—bringing relevance to business—reflects a human-centered perspective on technology, society, and culture. Thus, Domhnaill Hernon [70] credits E.A.T. program's essential contribution to Nokia Bell Labs with the artists' ability to bring the "human component" into the development of technology. It is important to them not only to develop technology for engineering questions, but also to create technology that is relevant for humans and society to express themselves and experience communication as humans.

4.2. *Innovation, Creativity, Creative Processes, New Perspectives, Motivation, Exploration of Needs of Future Stakeholders*

Noah Weinstein founded the artist-in-residence program at Autodesk in 2012. Named *Pier 9 Artist-in-Residence Program* [71], it hosted (growing) cohorts of over fifteen residency artists and other creatives, each for four months. The invited artists-in-residence (anyone who has a creative practice to their work) got access and training to use the Pier 9 workshop and were supported in handling Autodesk technologies. As Noah Weinstein explained, the residency was designed as a place for creative and experimental exchange. The idea was to bring together different creative practices and perspectives on projects and technologies, and to create an exchange between the creatives and Autodesk employees.

The process was very free, and the artworks produced at the end were presented in a final art show at Pier 9 and as “Instructables” [72]—open access instructions on their webpage to reproduce them.

In this process, artists-in-residence got opportunities to exchange their ideas and work practices with each other and with employees. They were guided by employees to work with the hardware and software at Autodesk to explore their limits, re-arrange functionalities, and alter technologies to reach the artistic goal. The experience of creative processes and artistic perspectives, the collaboration to reach an artistic goal and the creation of an explorative space all worked together to produce new experiences, motivate, inspire curiosity and stimulate enthusiasm, which in the end led to creative processes and innovation [73]. This would leave the tangible outcome of the program as art—which was also important for the artists—while enhancing the work process and boosting motivation of the employees, which could result in innovation. There could be other unexpected benefits too, like new directions in the security department [45]. Although this was a successful concept, there was also an interest in the company to test a new approach to create technologically or industrially relevant outcome. In 2018, the artist-in-residence program was changed to an innovator-in-residence program that would more directly produce innovative outcome [73]. The new program invites thought leaders and a diverse group of innovators to use the facilities [74]. The explorative space is still provided, but innovators, start-ups, and private research groups are invited to explore their ideas.

4.3. Social Environment, Organizational Goals, Future Vision, and Experimentation

The *Ginkgo Creative Residency* [75] at Ginkgo Bioworks was created by biodesigner Natsai Audrey Chieza, founder of Faber Futures [76], and scientist and communicator Christina Agapakis at Ginkgo Bioworks. The residency program offers a fully funded three-month residency (the artist/designer/creator is at a position on the same level as the scientists, including pay) and aims at addressing common goals and visions of Ginkgo Bioworks in collaboration with resident artists: to explore “innovative ways to design with biology” and “the potential and implications of synthetic biology” [77]. The residencies are offered to engage people in interdisciplinary collaboration to push the frontier of the field and apply critical thinking to design-driven problem solving. Thereby innovation is not expected as direct outcome but rather as collateral benefit through joint experimentation and exploration of the field and through creation of new experiences with new perspectives and processes. Additionally, the founders of the residency program point to the opportunity these projects provide to communicate with a wider audience about a broadly unknown field of research and development, to start a dialogue, and to educate and engage them. They feel this conversation with the audience, which goes beyond traditional campaigning, is necessary due to the newness of this scientific and business field.

4.4. Visions for Communication, Exchange with Society and Next Generation, Contextualization

The STEAM Imaging project created by Bianka Hofmann in collaboration with her colleagues at Fraunhofer MEVIS in 2017 [78], which will be hosted again by the Institute for Digital Medicine Fraunhofer MEVIS in 2019 [79], has been smartly integrated into the science communication of the organization by going beyond superficial ideas of communicating through art. It starts with an exchange between the artist, the scientists and staff at the organization. The artist will get into a dialogue with the scientists and staff to produce an artwork tackling research. In this process, interesting spaces for discussing research, its context, ethics, and possible implications can open up. Additionally, the outcome and the collaboration with the artist are cleverly interwoven with communication strategies and educational initiatives for high school students. As Hofmann [80] describes, the cutting-edge research and technology the organization is working with needs new models of communication to be discussed outside the research community and understood in a broader society. Contextualization through artsience projects provides an opportunity to discuss with new audiences and create scenarios involving the research to which the audiences can relate.

The interdisciplinary arts science workshops for school students aged between 12 and 15 years old are part of an initiative by Fraunhofer called “Talent School” and based on software and research at the Institute for Digital Medicine Fraunhofer MEVIS. The workshops are developed and realized in collaboration with the incoming artist. They aim to create an understanding of the interplay of disciplines in medical scientific research, including aesthetic dimensions. Above fostering their talents and interests through this experience, these workshops should create a contextual understanding of the science and technological investigation being done and enable an “intergenerational dialogue” [80,81]. Through both the workshop and the residency, which includes the production of an artwork, spaces for exchange, exploration and new perspectives are opened in which experts, artists and stakeholders are invited to discuss and engage. These stakeholders are the broader audience and school students representing the next generation.

4.5. Organizational Culture, Human Resources, and Organizational Mission

The residency program for artists and designers at the private Earth imaging company Planet Labs [82] was initiated and managed for five years (until 2018) by artist Forest Stearns. Artists are invited to spend three months at the organization. They define their interest within the organization and develop an artistic project within their residency phase, guided by the residency manager. The potential of humanizing the organization’s scientific vision and the motivational effects on employees are central to this program. The effects on the organizational culture, which encourages employees to think beyond disciplinary borders (or the limits of a given project) and to approach topics in a more open manner, are key reasons for keeping the program going.

Forest Stearns further explains the effects of the artist-in-residence program he experienced in his time as residency manager, on hiring, inclusion, and employee retention [45]. One major observation was that organizations are in competition with each other to employ the best scientists and engineers. The artist-in-residence program in the free and explorative way as it is advertised, has been named by a number of scientists and engineers as one of the reasons that they applied for a position in this specific company—the support for artistic expression and projects is a sign of a certain open culture in the organization, which hopefully also allows scientists and engineers to express innovative thoughts and to realize some of their approaches based on out-of-the-box thinking. Additionally, inviting artists with residency opportunities has been experienced as catalyst for cultural inclusion. The notion of inclusion has become more tangible within the organizational culture, as new personalities and artistic expressions are always experienced and included in the organizational life. Lastly, Forest Stearns found that the artist-in-residence program contributed to employee retention, even for employees who do not actively collaborate with incoming artists. The experience of the art and conversations about the projects can contribute to relaxation and delightful breaks.

5. Implications for Organizational ArtScience Initiatives and Managerial Challenges

Investigation into the individual processes of collaborative arts science projects and the stories about arts science programs in organizations reflect general findings of research on ABIs in organizations: that the interaction happens mainly on the personal and interpersonal levels [3]. This is the level where most effects have been found. These effects of the interaction between incoming artists and employees in the organization can be understood from multiple theoretical perspectives relevant to organizational culture, human resource development, innovation and creativity, strategic development, products, and vision [4]. For example, seeing organizations as a set of practices [83] can help to understand the contribution of individual learning and interpersonal experiences in arts science collaboration to organizational needs.

More specific research on creativity and artist-in-residence program has shown that creativity does not spread by only inviting artists into an organization, and that there has to be space for interaction and exchange [84]. Creative ideas and innovation, even completely unexpected output, can emerge from the collaborative process that is based on interaction where “everyone contributes from their

perspective and experiences” [85]. The artist’s perspective and experiences bring a new point of view into the discussion within an organization, whereas the employees’ experiences and perspectives can be fresh and inspiring to the artist. Such artsience initiatives barely deliver final answers or definite solutions to problems, but can open up new opportunities, ask different questions, point to new ways, engage different groups in a new way, and add to personal learning.

Sometimes outcome directly stems from these interactions, especially when they are set up as problem-solving opportunities, but in most cases the effects of the learning processes on the development of current or future projects of the scientist, the artist, or in the organization can mainly be identified retrospectively. Already Latham argued for system thinking to understand the opportunities for development artist-in-residence programs generate [24]; and organizational theorists point out that systemic perspectives also allow for better understanding of artistic contribution and effects of engagement with art in organizations [86]. Nevertheless, engagement in terms of reflection on the experience after the artsience interaction ended, integration of the effects in work processes and possible projects inspired by it is essential to allow for sustainable contribution [44]. This largely depends on how leadership supports the learning processes and integration of effects [38]. The cases also show that the effects on the individual level need to be related to organizational goals and communicated through managerial arguments to give them space to grow. It is part of leadership and management responsibilities to understand and integrate the process and effects of artsience opportunities on the individual level with organizational needs and goals.

Leadership and management also must be able to communicate the value of the contribution beyond physical or tangible outcome. Although it is difficult to measure a direct connection between the employees’ experience and their future work processes, project ideas, or enhanced ability to deal with complex issues, mechanisms can be put in place to facilitate, document and track their reflections and manifested changes. Such mechanisms not only deepen individual learning, but also encourage connection with and reinforcement of organizational needs and goals. They facilitate attention to and broader understanding of the transformation initiated through ABIs and thus make their impact explicit. A question frequently asked of artsience programs and ABIs in general are their “ROI” (Return on Investment). In addition to whatever quantitative return that may be appropriate depending on the nature and objectives of the program, qualitative return should be considered and asserted. As the corporate world becomes more conscious of its social and environmental responsibilities in addition to profit-making, and frameworks such as “Triple Bottom Line” gain acceptance, measuring a firm’s impact on People and the Planet in addition to its Profit, efforts can be made to map the ROI of artsience programs and ABIs to broader bottom-line evaluations.

The creation of successful artsience programs that are also perceived as such internally in the organization is an intimate process depending on the organizational culture, goals, research, and structures (including available facilities). Thus, intense planning, curation, and facilitation are essential for the success of the program [10,45]. This comprises definition of the goal of the artsience program, design of its format, integration and reflection within the organization, space for employees to engage, communication strategies, selection of the artists, and careful curation of the process. Programs with limited space, resources, and engagement opportunities do not satisfy expectations nor do they contribute much to personal learning, or appreciation of the initiative through participating individuals. Therefore, managers have to understand the specificity and context of their organization—there is no one best way [87]—and understand what the positive notion of collaboration means: “a process of shared decision making in which all parties” take part voluntarily, constructively explore differences, commit to the process, and “develop a joint strategy for action” [88]. Managers also need to be aware of responsibilities and hierarchies within the organization and help the collaborators to overcome possible structural issues, because trust and the ability to stay true to one’s personal perspective on the topic are essential.

Diverse approaches are possible for creating artsience interactions in organizations: artist-in-residence programs, artists as part of the project team or laboratory, long-term one-to-one

artscience relationships, short-term collaborations, or even single encounters as quick exchange and input. Artist-in-residence programs can be targeted towards artists who are interested in the organization and its goals as such, in specific R&D projects, in specific department of the organization, or in a team, lab or as one-to-one collaboration. Other opportunities can be fellowships and visiting artist (like visiting researcher) positions. Most important before creating opportunities is to think about the levels on which the contribution of the artscience collaboration should take place. Finesse in the selection and combination of people, themes, projects and relationships is important.

Since artscience collaboration in the organizational setting, and even ABIs in general, are still on the fringe of management practice, such programs often exist in a precarious position. Some of them rely on the backing of an executive leader who intuitively appreciates the value of art, but are subject to cancellation when more linear, analytical leadership takes over. Some managers may find it difficult to make a business case for such investment, even if they personally would like such a program. When economy goes into a down cycle, programs of this kind are also likely to be the first ones to be cut. This is not necessarily unique to artscience or other ABIs—any “non-core” activities, especially future-oriented with no immediate outcome, are likely to encounter resistance and receive the “axe” upon the first sign of economic softening. When the approach is novel, its advocate also shouldered more career risk. The better known and more widely adopted the practice, the less risk it poses to the internal champion, and the more it can be institutionalized as an integral activity of the organization. To achieve this, it helps to redefine objectives of such investment and evaluation criteria of its “returns”, in light of the findings and insights from our research.

6. Further Research and Future Directions

More targeted research into organizations with artscience programs and long-term developments associated with these initiatives will be necessary to better uncover how connections between artscience programs and organizational needs and goals can be created and manifested, so that such initiatives can gain more legitimacy and strategies for following up on ABIs can be devised. Research into the relevance of artscience programs for change or development of organizational culture will help to create in-depth understanding of how these programs are perceived and how they can create an atmosphere of openness or contribute to employee retention as described by researchers and program managers in the interviews. We also believe there are many opportunities for artscience programs to evolve and further develop their potentials, by connecting and interacting with adjacent movements in academic, business and social arenas, for synergistic growth.

6.1. Longitudinal Studies across Disciplines

Based on the initial research on connections between artscience collaboration and creativity, personal learning, social networks, and other effects on the individual level, it will be important to follow artscience initiatives with long-term studies to better elaborate on their connection to innovation and heightened creativity. This will also help to design better organizational structures to integrate these effects and allow for future creative processes.

Historical cases that spawned new fields in art, science and technology, or contributed essentially to the development of hybrid fields, will be helpful to understand the potential of outcome which are not immediately perceived as tangible innovations. These include the invention of linear perspectives in painting during the Renaissance which fundamentally reoriented Western society from God-centered, dualistic, and medieval worldview to spatial, materialistic realism, and influenced the rise of modern science [89]; Joseph Beuys’ Social Sculpture and art-driven transformation approach which anticipated today’s open social innovation [90]; the countercultural ideals and bohemian spirit of the San Francisco Bay Area which gave rise to Silicon Valley’s personal computer revolution [91]; and the art project *Piazza Virtuale* by Van Gogh TV presented at Documenta in 1992, an interactive platform for TV audience, that anticipated forms of interaction on social media platforms [92]. There were, of course, contribution to the emergence of computer graphics and the use of computers in the production of art, sound,

and performances that started in connection with experimentations in the 1960s [21,23]. Ideas stemming from these interactions often need further elaboration and contextualization to demonstrate their contribution. This is an area where art historians, science historians, and business scholars can combine knowledge and investigation, breaking out of their disciplinary silos. When art historians alone study the impact of certain art movements or phenomena on society and commerce, they may have limited reach outside their very specific community. Moreover, their specific perspective, knowledge base and data lead to research questions that lie within their field, not pushing them to detect and articulate hidden connections and gradual effects outside their realm. Combining perspectives from art, science and economics history may yield interesting discoveries, connecting dots, uncovering lineage and revealing patterns of contribution art makes to scientific, technological and commercial advances that will be heard by these different communities.

Artsience organizations active since the emergence of the modern artsience movement in the latter half of the 20th century have had a few decades of experience. A conscious effort can be made to reflect upon their journey, compile stories of cross-fertilization, and evaluate and publicize their impact on society and business. If such a study is difficult due to inadequate archiving, lack of continuity and knowledge transfer among staff, or funding constraints, new initiatives such as STARTS have the benefit of hindsight and the opportunity to build in such mechanisms from the beginning, with a set of criteria and measurements appropriate for their mission, periodically reviewed and updated to reflect new realities and ambitions.

6.2. Exploration of the “Third Culture”

Additionally, there needs to be further research contextualizing hybrid outcome of artsience collaboration and spaces to present and discuss it. Artsience collaboration potentially spurs interpersonal learning, overcoming cognitive biases and social dynamics (as shown exemplary above), as the process involves meeting of individuals from different backgrounds with different work processes, skills and perspectives. This meeting generates hybrid outcome. It also leads to the development of a “third culture” [93], where natural sciences and literary intellect meet, that allows for more fluid exchange between the scientific disciplines and art, and creates new spaces both groups can occupy, where artsience practitioners work towards [94,95]. But how does this relate to specific disciplines and their peculiarities within society and organizations? Whereas artists can play with fiction and challenge existing boundaries, scientists are bound to talk about facts and figures [96]. How would such a development of a third culture expand into organizations and affect their processes and structures? Or would such a third culture help them to better communicate new fields of activities like synthetic biology, or make them more adaptable for coping with technological advances and digitization?

6.3. Implications of “Exponential Technologies”

As artsience collaboration is connected to the latest developments in science and technology, with their contribution to and potential pitfalls in society, economy, and industrial practices, another important research question is to look at how artsience collaboration can help organizations navigate changes and issues stemming from these developments: automation, digitization, replacement of traditional products, professions, and new ways of working. Conversely, exponential technologies such as Internet of Things (IoT), artificial intelligence (AI), machine/deep learning (ML/DL), virtual/augmented/mixed reality (VR/AR/XR), 3D printing, blockchain and crypto currencies may have implications on artsience collaboration itself: both as content to reflect on, and as adoption in its own structure. Such technologies and digitization in general are shrinking or distorting time scales on many levels, from product lifecycle to the spread of political/social movements. Can exponential technologies be leveraged to create new operating models for artsience programs and ABIs? Will they potentially shorten the long-term time horizon henceforth required for artsience effects to manifest? Can they be harnessed to develop new ROI business models capturing the value of arts?

6.4. New Value Propositions

New social and market forces are both demanding as well as providing opportunities for new value propositions of artsience programs. ABIs from the 1960s already had specific goals such as process insights, artistic exploration of industries, contribution to artworks employing new media, and cross-disciplinary exploration of new technological developments. However, due to difficulties of articulating effects, determining impact or categorizing the outcome, their value was not fully realized. Recent artsience programs and ABIs can draw upon advances in organization studies, media art in society, and art history to become more impactful and to better articulate the impact. A comparative study between these previous and more recent ABIs, along with exploration of adjacent disciplines and related movements, could reveal how they can be improved in the future to broaden and deepen their added value. Here are but a few promising areas:

Strategic differentiation. As the marketplace becomes increasingly crowded, and supply exceeds demand in many industries, traditional competition-based strategies are no longer effective for sustainable growth. Businesses need to learn to stake out unexplored, “uncontested market space and make the competition irrelevant” [97]. Art, in its essence, finds “differences among things that are similar” [98]. How can its power to create experiences that are unique, exceptional and meaningful be channeled into business strategies? This is an opportunity for new perspectives—like artistic ones—to contribute to broader developments.

Human connection. One major difference art makes is human emotional connection. Consumers today expect more than utility from their purchases. Products and experiences that evoke wonder, joy, hope, and happiness, or help personal expression, can connect with consumers on a deeper level and command a premium. This is especially pronounced with the millennial generation, about to enter its prime spending years, which values experience more than physical possessions. The “human component” articulated by Domhnaill Herson underlying Nokia Bell Lab’s E.A.T. program is relevant to many other companies and industries.

Higher purpose. Keenly aware of the challenges the world faces, due in part to industrial damages and corporate greed, many consumers and young employees alike want to hold companies accountable to their business practices affecting all stakeholders as well as the Planet. Big business is also recognizing that “pursuing shareholder value is no longer enough” [88]. Despite skepticism and challenges in measurement and implementation, frameworks such as Triple Bottom Line (TBL) mentioned above are making inroads among organizations. Environmental, social and governance (ESG) criteria are used in more and more financial investment decisions by asset managers [88]. A new concept takes TBL even further, to Quadruple Bottom Line, adding humanistic values such as spirituality, ethics, purpose, and culture [99,100] as a fourth factor to an organization’s reason of being. Art has unique roles to play across all these value domains, but probably the strongest in the fourth bottom line.

Innovation Paradigms. As engagement of artists brings new perspectives and increases variance and divergent thinking, enhancing ideation quality and problem-solving potential, artsience programs can be embedded in the myriad forms of corporate innovation programs beyond traditional R&D labs. An especially natural fit may be the open innovation paradigm, “a distributed innovation process based on purposively managed knowledge flows across organizational boundaries” [101], which may involve both the firm’s internal ideas as well as externally sourced views from creative consumers [102] and communities of user innovators [103]. Here, the value of artsience collaboration can presumably be more easily understood and justified.

6.5. Collaboration with Neuro-Leadership, Neuro-Aesthetics, and Other Neuroscience-Applied Fields

In addition to the aforementioned development in neuro-leadership, neuro-aesthetics as a relatively recent sub-discipline of empirical aesthetics is attracting increasing international interest, including in the artsience community. Neuro-aesthetics studies “the neural bases for the contemplation and creation of a work of art” [104], understanding and explaining the aesthetic experiences and sensory

knowledge using neuroscience. These neuro-related fields and organizational aesthetics each emerged one or two decades ago but have not interacted much with each other. Bringing them together presents a fertile ground for the development of each—art creates, cultivates or facilitates the aesthetic experience; whereas neuroscience analyzes and measures such experience. Despite its currently somewhat narrow approach reducing aesthetic experience to a set of physical or neurological laws [105], neuro-aesthetics may help validate artsience collaboration and ABIs with measurements and data, shedding more light on their connection with outcome relevant to the organization.

6.6. *The STEAM Movement*

Lastly, STEM to STEAM is currently an important discussion in the world of education. How does this movement relate to managerial challenges and organizational strategies in their R&D departments, human resource development, and artsience programs? Might it lead to a new kind of incubator, either university-initiated, independently operated or corporate-affiliated, as a new innovation engine, with interdisciplinary creativity in its DNA? Are there any such platforms already in existence? Might it be integrated and streamlined with artsience programs? How might educational institutions proactively help shape the future of work, rather than merely react to employers' current needs? What are the implications to organizational learning and development, when a new breed of talent educated the STEAM way, which is better suited for tackling complex issues organizations face, enters the workforce? What new thinking will be needed from a human resources perspective, on their hiring, training, and retention? How might organizations redesign their structure to both take advantage of the well-rounded skills of this new talent and cater to its development? These questions may lead to interesting discoveries and potential new opportunities for artsience collaboration.

7. Conclusions

Artsience collaboration programs in organizations as a specific form of ABIs show a lot of potential on the individual level and on the interpersonal level. Depending on their design, they can additionally contribute to organizational goals and needs in various ways. Nevertheless, it is difficult to measure outcome directly and long-term effects are difficult to determine or foresee. Thus, artsience collaboration programs are not standardized management tools; they have to be developed and realized carefully depending on the organizational culture, context, and needs. Additionally, as individuals only engage in artsience collaboration if they are interested, artists and scientists need to be motivated and understand the value for their personal development through such process. Intertwining the different needs, artsience collaboration can be extremely valuable to all contributing parties, to the organization as a host, to its environment and stakeholder groups, as well as to the development of artistic and scientific fields—as many cases show. More targeted research and broader value proposition will help better understand and demonstrate such value. Neuroscience can be one of the new tools to validate and measure the value on human levels; and related movements in open innovation and STEAM can help guide design of the next generation artsience programs, and further materialize their potential.

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Article

Joseph Beuys' Rediscovery of Man–Nature Relationship: A Pioneering Experience of Open Social Innovation

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Abstract: The emerging paradigm of sustainability represents a challenging field in terms of new technologies, market regulations, and business models. Limits of both linear industrial development and consumerist way of living have been clearly identified since the late 1960s by the first systemic studies on the effect of human activities on Earth. Many contributions from different disciplines have paved the way for an open, participated, and responsible innovation approach, which is presently triggering the transition toward a nonexploitative human development. An anticipation of this conceptual framework can be found in Joseph Beuys' art, which can still represent a source of inspiration for innovators, entrepreneurs, economists, and community leaders. In his artistic legacy—from the six blackboards of Perugia to the 7000 Oaks of Kassel—Beuys is still asking us to transform our everyday actions, joining the collective effort toward a new evolutionary stage of humanity, founded upon a holistic vision of society and nature.

Keywords: Beuys; social sculpture; ecology; open innovation; social innovation; entrepreneurship; sustainable development

1. Introduction

Limits of both the linear model of industrial development and consumerist way of living have been clearly identified since the 1960s by the first systemic studies on the effect of human activities on the environment. Pioneering studies such as *Silent Spring* by Rachel Carlson [1] and the later comprehensive report *The Limits to Growth* issued by MIT in 1972 [2] showed to a broad public for the first time that mankind should reconsider its role in a limited world where available resources and living species, including humans, are not arranged hierarchically and autonomously but through interconnected and fragile networks. Recent analyses are confirming that, in spite of the growing debate, the inertia of both economy and demography is driving the world toward the “tipping point” [3].

Nevertheless, fundamental advancements—even if mostly at a theoretical level—have been registered in setting up a “culture of transition”. We can mention, among others, the introduction of the deep ecology approach by Arne Næss [4], the responsibility principle by Hans Jonas [5,6], and the precautionary principle as part of the 1992 Rio Declaration [7]. Since the Rio Declaration, the concept of sustainable development (SD) has been widely adopted at different policy levels, forcing a sense of responsibility for future generations [8]. A comprehensive vision of sustainable development was finally established with the Sustainable Development Goals 2030 (SDGs), which was approved by the UN Assembly in 2015 [9].

The basic principles embedded in the UN SDGs envisage a circular and socially responsible economy where natural resources are not overexploited and where communities are the effective beneficiaries of economic growth. Binding the preservation of the environment with social justice and equality is then considered the only possible framework for a long term, peaceful development of

human societies [10]. The switch to such a new model, where economic and welfare expansion are no longer sustained by the detriment of the global ecosystem, represents a challenging field of innovation in terms of technologies, regulations, business, and social models.

In parallel to the relatively slow progress in the adoption of SD principles and policies by the public and the private sector, a broad range of bottom-up initiatives have been flourishing, supported by the emerging paradigm of open innovation (OI), which has been expanding from the core technological innovation domain—as initially explored by Chesbrough [11]—to a broader extent, including technology, social, and environmental dimensions [12].

In this study, we will highlight how Beuys anticipated, through his artistic life and production, the combination of social open innovation methodologies, which are presently applied to support a contextual transition towards environmental, economic and social sustainability. The sense of urgency, an open and collaborative approach, the search for disruptive solutions to be scaled-up at a global level, the fundamental role of individual engagement and creativity, and the idea of “shaping” the change, which is presently characterizing the social open innovation arena, can all be found along the artistic path of Beuys from the years of the Free International University to the ultimate 7000 Eichen urban art project in Kassel.

2. Methodology

The aim of the present work is to show how the artistic activity of Joseph Beuys can be considered a substantial anticipation of the present crossover between OI methodologies and social innovation practices aimed at implementing the sustainable development model. Nowadays, participated design approaches, such as living labs [13], design thinking [14], and knowledge arenas [15] are widely used to catalyze creative and entrepreneurial energies as well as knowledge and technology providers. Recently, the SDGs have been explicitly recognized among the emerging drivers of OI processes [16], while typical OI approaches, such as crowdsourcing [17] and crowdfunding [18], have already been adopted in a large number of initiatives that are presently supporting both social and environmental resilience at the community level through participated transition management [19] and holistic strategies [20].

Keeping this emerging framework in mind, in the first sections of this study, we will introduce Beuys’ concept and praxis of Social Sculpture, where most of the actual open innovation methodologies can be recognized. The specific engagement of the artist toward the regeneration of the man–nature relationship will be discussed as will his search for an alternative, participatory social development. Beuys’ legacy in the field of anthropocentric art will be reported for the sake of a broader representation of the artist’s impact. For the purpose of this study, the artistic contribution of Beuys will be essentially limited to the political, social, and conceptual level, substantiated by some representative works, reports of performances, and interviews.

In the later sections, we will compare some of the contemporary open social innovation practices and their growing influence in the field of sustainable development with Beuys’ Social Sculpture framework, highlighting the actuality of Beuys’ lesson and the uniqueness of his message.

3. Beuys’ Approach to Change: From Individual Artwork to Collective Transition

According to Beuys, the transformation of the world is in the hands of artists, and everyone could become an artist and change the world. Thus, art is a powerful political tool, and education toward art expression is a political project [21]. This concept is embedded in the discipline of Social Sculpture/Social Architecture [22], which he defined as a way to “*mold and shape the world in which we live*” [23]. Through the social sculpture, everyone can contribute in the shaping of human society by an artistic act, “*which could comprehend both physical and spiritual material*” (ibid.). For Beuys, transforming the acts of everyday life into art was the only way to really overcome the status of alienation that characterizes individuals and societies, both in the capitalistic and the socialist world. Interviewed by Dušan Bjelić in 1982, he said:

"My understanding of art is strictly related to everybody's work. [...] So organically it is related to the working places of the people. And the element of self-doing, the element of self-determination, self-administration and self-organisation is the element of this anthropological type of art" [24].

In Joseph Beuys, such passionate engagement in provoking societal changes meets a deep love for nature. This attitude is substantiated in an artistic production that is in line with the tradition of German Expressionism, with a large use of abstract and symbolic representations where the artist is presenting himself as a shaman who can connect the interior life of humankind with the hidden powers of nature [25].

As reported by Beuys himself, his ideas about the connection of men and nature were deeply influenced by Rudolph Steiner, whose works he approached in the 1940s, just after the war [26]. The triadic nature of society, which characterized Steiner's philosophy that combined spirit, law, and economy, was clearly incorporated in Beuys' conceptual framework. This legacy can be identified through a comparison of the drawing entitled *Other heads on our shoulders* made by Steiner in August 1919 [27], with Beuys' drawing entitled *Honey Pump* in the MUMOK collection. In Steiner's work, a rotating wheel is made by three fully interconnected sectors named "commodities", "labour", and "capital", which have the attributes of economic, rights, and spiritual life, respectively. Beuys' work represents—in a very similar way—the sketch of a motor pumping the honey, with the words "economy", "law", and "will" around it [28].

In a performance (an Aktion, in Beuys' definition) in 1974, Steiner's triadic representation of individuals was represented through three pots, which signified the three components of human personality: thinking, feeling, and will [29]. Beuys' scholar Shelley Sacks clarifies the link between the triadic nature of human beings and the need for positive evolution in the triadic nature of society:

"This threefold human being underpins Beuys' unflagging commitment to the need for direct democracy, to an associative economics, and to a free educational and cultural sphere that would enable people to realize their higher abilities" [27].

In addition, Beuys' interest in bees has been influenced by Steiner, who explicitly compared the beehive to the human brain: *"inside the beehive things basically happen the same way, only with slight differences, as they do in the head of a human being" [30].* Both the individual and the social collective mind can be represented through the beehive metaphor, and a transition can be triggered by the adoption of appropriate practices in both. As Beuys said, *"the bee simply collects what is there and takes it to a higher level" [31]* and does that in a collective manner, resembling either the cells in a human body or the thoughts in the human mind. According to Beuys, *"in practical terms, the human being is also a swarm of bees, a beehive"* (ibid.) and *"honey is doubtlessly a living substance. Human thought can also be living" [32,33].*

A framework for the transition was defined during Beuys' participation in the Fluxus movement, which was challenging the traditional *"boundaries between art and life and between the various arts" [29, 34].* Beuys expands the interdisciplinary, but individual, experience of Fluxus toward the Social Sculpture concept; the fundamental difference is the entanglement of the artistic process with the social, economic, political, and environmental criticism having the aim of triggering a collective transition and shape society.

Both vision and methodology became clear with the foundation of the Free International University (FIU), whose manifesto was published by Beuys and the novelist Heinrich Böll in 1972. FIU promoted the expression of creativity, which characterizes any human being, as the *"the ability to shape material that could be expanded to other socially relevant spheres" [35].* *"Jeder Mensch ist ein Künstler"*: again, for Joseph Beuys, art was everyone's capacity and the FIU should support the expression of such potentiality by leveraging the artistic capability of everyone and connecting each individual talent with others and with social challenges. In the promotion of FIU in the United States, under the title *Energy Plan for the Western Man*, Beuys was affirming that:

"Art is the only possibility for evolution, the only possibility to change the situation in the world. But then you have to enlarge the idea of art to include the whole creativity. And if you do that,

it follows logically that every living being is an artist—an artist in the sense that he can develop his own capacity. And therefore it's necessary at first that society cares about the educational system, that equality of opportunity for self-realization is guaranteed" [23].

The event *Honey Pump/100 Days of Free International University*, performed as part of Documenta 6 from June to October 1977 in a room of the Museum Fridericianum of Kassel, was a concrete experimentation of the Social Sculpture concept. Thirteen workshops gave the opportunity to discuss global issues and challenges. The venue was marked by a sculptural installation, a new version of Beuys' honey pump, which was continuously processing both vegetal fat and honey. Fat was embodying the process that brings chaos to order [29], thus representing the initial "brownian" agitation of disparate thoughts to be transformed into a solid common view that is able to drive the change of society [36]. Honey also has alchemical properties coming from the conversion process of the pollen, performed by the bees.

The characteristic multidisciplinary approach "from chaos to order" of Beuys was fully implemented in the featured series of workshops held in *100 Days of Free International University*. Participants and invited people (including trade unionists, lawyers, economists, politicians, journalists, community workers, educationalists, and sociologists, together with actors, musicians, and young artists):

"pooled and compared their practical experience [. . .] to cover a range of pressing themes in which radical and creative new thinking is urgently needed, discussed in the interdisciplinary way which is otherwise impossible in a world of rigidly separated specializations [. . .] the workshops were an organic part of a work of art (Honey Pump); but they were also a practical forum for the pressing issues of society" [29].

The entrance was free: Anyone could join without application, in line with the participative framework of the Social Sculpture. Hundreds of participants took part, under the concept of "unity in diversity". Each workshop, except the last one, addressed a specific, hot social and political topic: world peripheries, energy, empowerment of local groups, media manipulation and alternatives, human rights, urban decay, migrancy, the Northern Irish question, possible paths of change in the Third World, violence, and unemployment. The final, 13th workshop was a wrap-up session of the overall period of 100 days. The format of each session was a mix of invited lectures, open group conversations and, eventually, exhibition of art [37]. As in beehives, each individual participant, and not just the experts, contributed to innovate and create new value for society. Figure 1 shows the placard used to present FIU at Documenta 7, with the motto "*Kunst = Kapital*" in evidence.

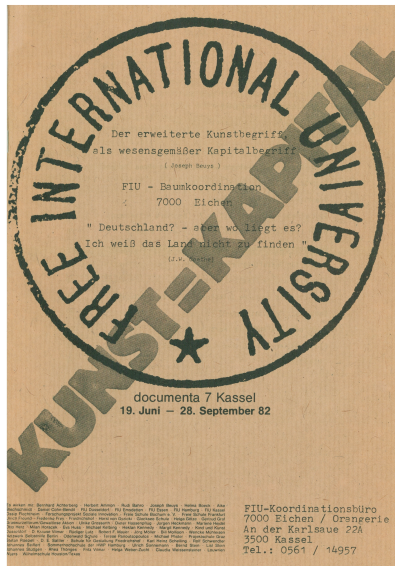


Figure 1. FIU placard at Documenta 7 in Kassel with the equivalence Art = Capital [38].

4. The Political Commitment and the “Defense of Nature”

The FIU period was characterized by a growing active commitment to the German environmentalist movement. In December 1978, Beuys published the *Aufruf zur Alternative* (Appeal for an Alternative) in the *Frankfurter Rundschau* [39]. In this manifesto, the Social Sculpture is proposed as a way to redesign the European society in a radical alternative to Western capitalism and Eastern communism [40]. According to Beuys, money and state control of society are responsible for the postwar “*crisis of consciousness and meaning*” as well as for the environmental crisis. As a matter of fact, Beuys’ political activism had begun a decade earlier with the establishment of the German Student Party (Deutsche Studenten Partei, or DSP) in 1967, which was closely linked to student movements in West Germany, to protest against nuclear armaments and the Vietnam conflict and to promote reform of the education system [41]. DSP was already specifically marked by an interest in political ecology and a utopian approach, with some distance from the Marxist movements. In 1970, Beuys founded the Organisation für Direkte Demokratie (Organization for Direct Democracy, or ODD), whose mission was to support citizens in promoting new legislation, thus giving an alternative to the dominant political party system [32]. A participative process was established to encourage open conversations and discussion groups toward the promotion of referenda on different issues addressing social rights and the environment [42].

Environmental destruction due to heavy industrialization, concerns regarding nuclear escalation, and the growth of student movements were driving the rise of the green movement in West Germany [43]. Beuys found the opportunity to settle at the fundamentals of the new political area, the values of freedom, creativity, solidarity by inviting different alternative movements to join their efforts in a coalition marked by a broadened approach to ecology that incorporated economic equity and individual rights. Die Grünen (the Greens or the Green Party) were intended as the organization able to promote in society the elements of the social order auspicated in the FIU activities [ibid.]. The direct political engagement of Beuys culminated in his candidature for the European Parliament elections in 1979. His campaign was characterized by a poster representing his sculpture *The Invincible*, made in 1963, where a small hare is facing off a toy soldier with a gun, meaning that the spiritual strength, represented by the hare, will always resist against any aggression and violence [40].

The Green Party, also thanks to the growing presence of Beuys in the media, was successful in introducing its key objectives into the German political agenda [44]. However, the progressive integration of the Greens into the institutional system and the adoption of a more structured internal organization prompted Beuys to gradually keep a distance as the praxis became too far from his creative, individualistic, and utopian attitude. His sense of urgency for the conservation of nature and a more equal and free society again found a most appropriate expression in the Social Sculpture practices. After his exit from the active political arena, he dedicated part of the last 15 years of his life to the comprehensive project named *Utopia of the Earth* or *Concrete Utopia*, which had declined in three sites: Seychelles, Bolognano, and Kassel. After the first work in the Seychelles, performed from December 1980 to January 1981 with the support of Lucrezia De Domizio, he started the *Piantagione Paradise*, where 15 hectares hosted a re-established biodiversity through the plantation of autochthonous vegetal species that had been removed for economic reasons, in Bolognano in the Italian region of Abruzzo in 1982 [45]. Beuys' action in Abruzzo opened the debate about *The Defense of Nature*, which was the title of the public event presenting the *Piantagione Paradise* when Beuys was awarded the honorary citizenship of Bolognano [ibid.].

The third and last action of the *Concrete Utopia* program was *7000 Eichen* (7000 Oaks), proposed by Beuys to Documenta 7 held in Kassel (Germany) and directed by Rudi Fuchs [46]. The artwork consisted of 7000 trees to be planted inside the city of Kassel in order to recover the damages lasting from the Second World War.

Trees had to be placed together with basalt stone columns (see Figure 2), with the motto "*Stadtverwaltung statt Stadtverwaltung*" (a forest-like city instead of an administrated city).



Figure 2. (Left), Basalt steles were in front of the Museum Fridericianum [47]. (Right), an oak planted during the 7000 Eichen is now embedding the basalt stele [48].

It was a social sculpture asking citizens to be part of the urban regeneration process, proposing sites, and planting trees in cooperation with city planners, gardeners, and environmentalists. The activities lasted from 1982 to 1987, about one year after the death of the artist. *7000 Eichen* can be considered as a summa of Beuys' philosophy: (i) It combined participation for social change, individual creativity and "beehive" cooperation, regeneration of the man–nature equilibrium. (ii) The oak was part of the legacy coming to the artist from German mysticism and an essential part of the German landscape as well as the basalt stones. (iii) The steles were physically embedding the Social Sculpture process as they were all initially placed in a large pile in front of Museum Fridericianum, which performed such a counter to the end for the whole duration of the project. (iv) All the elements, living and inanimate, of the artwork were considered as part of a long-term transition: the basalt steles dominate at the beginning and then leave the floor gradually to the live oak trees, but they will last as a network of signs

marking the city's landscape with a collective will to save ourselves and the planet [49]. The project was again about individualities to be shaped toward a healing process of both society and nature:

"I wish to go more and more outside to be among the problems of nature and problems of human beings in their working places. This will be a regenerative activity; it will be a therapy for all of the problems we are standing before" [50].

It was financed by a crowdfunding process that merged different kinds of contributions, from sponsorships to donations and funds acquired by Beuys from the sale of his artworks. According to Beuys, the project should awake individuals and organizations from their passive attitude, triggering their engagement into the global environmental change. Today, the effects of this catalyzing effort can be seen not only in Kassel but also in various locations around the world, with a large number of adaptations and commemorations, and especially in the memories and attitudes of all the people who have been part of the project as donors, experts, gardeners, and active citizens.

A further step in the *Concrete Utopia* was the unfinished *Helicopter Project*, where the technological dimension was also incorporated into the Social Sculpture framework. An inaccessible mountain ecosystem in Vallo Malbasso close to Foggia, injured by the artist himself as a young German soldier, should be repaired by a seeding process, scientifically planned and performed from a helicopter representing a technological extension of the human being in the journey of reconciliation with nature. This Aktion, completing the transition from the *"Thanatos of the wartime insults to the Eros of the Defense of Nature project"* [51], was unfortunately halted by the death of the artist in 1986.

5. Blackboards as Blueprints of the Creative Process

During his artistic performances, Beuys extensively used both his body and blackboards. These were a distinctive tool of Beuys' pedagogical action [52], documenting the progress and the results of the creative process during the Aktion format. This attitude has been likely inspired by Rudolf Steiner [27,53]. Steiner's blackboards were the result of an expressionistic combination of words, diagrams, and drawings. Beuys' blackboards had the same role in representing the result of a unique creative process, as *"living reminiscences and blueprints for further action"* [32]. During the Aktion performances, blackboards were combined with another Steiner's legacy, the *"eurythmy"*, consisting of a sequence of coordinated gestures used by participants to communicate with each other [54].

As art-making is an experience of making and sharing, and as all humans can be artists, teaching is vital because it fosters the recognition and exercise of each potential artist. For this reason, along with the development of a performative language that could trigger political and social change, Beuys was cultivating a distinctive teaching style as a master of arts who has the pedagogical role of assisting emerging artists in finding their way to be part of the change. As Professor of Sculpture at in Düsseldorf Kunstakademie (see Figure 3) from 1961 to 1972 [55] and in performances and events held at FIU or later, he engaged in an interactive dialogue with potential artists, using the blackboards to gather blueprints for future expansion and re-invention (see Figure 4).



Figure 3. Joseph Beuys photographed by Hans Lachmann at the Kunstakademie in Düsseldorf [56].



Figure 4. Joseph Beuys on his lecture “Jeder Mensch ein Künstler—Auf dem Weg zur Freiheitsgestalt des sozialen Organismus”. Behind him, the outcomes of the discussion are being fixed on a blackboard [57].

Blackboards were fixing the results of a theatre–theorem, literally a representation of what Beuys was calling the Art–Science, a search “in which, with actions and works, comes the investigation of the Truth which is the basis for practical action” [51]. According to W. Wildgen [58], Beuys’ conceptualizations “are not a pathway towards a scientific model in the strict sense” but they represent an effort to promote innovative science through “theoretical intuitions, which can be sketched diagrammatically and later lead to exact theories if a proper mathematical formulation is found and if the predictions of such a model are checked in experiments or evaluated in relation to given observations”. In such a way, Beuys’ diagrams have the aim to give a sense of direction for an emerging multidisciplinary science that should support the search of solutions for urgent social and environmental challenges.

A key lasting artwork, showing the complexity of Beuys’ reasoning on a sustainable future of earth and humanity, is represented by the six blackboards drawn down in a performance held in the foundations of Rocca Paolina in Perugia, on 3 April 1980. The photographic reportage of

the performance shows Beuys transforming his thoughts into ideograms on the large blackboards, now owned by the Municipality of Perugia and preserved in the civic museum of Palazzo Penna [59]. These six blackboards are of particular interest for the present study as they represent a true transitional program, affording in a comprehensive approach the socio-anthropological, economical, and political implications of regenerating man–nature relationships. Looking at the blackboards, we can note the following: (i) In the first one, we see two human figures stay above the Sun—this is the Campanella’s City of the Sun in which systems and institutions are not the result of habits inherited from tradition but the expression of the natural reason of man, the new anthropological position is linked down with nature as well as upwards with angels or spirits. (ii) The new society is founded on a transformative plan, which ensures a democratic distribution of wealth and energy; this concept is represented by a cube, full of distributed power, which wins the gravity thanks to an energized lever. (iii) In the third blackboard, an unfolding string represents the renovated flow of the energy of life; a pastoral stick, connected to the string through a tank, shows the expanded sensory faculties of human beings—the energy of life and the enlarged sensory faculties of man will be all aimed at consciously thinking about a fair right to work and therefore a gain for everyone. (iv) A balance must also be sought between production and consumption; a circular economy process is clearly sketched in the fourth blackboard, where progress in freedom and self-determination is also envisaged. (v) A swan, in the fifth blackboard, would bring a new Lohengrin to help humanity in finding the right balance between statism (gravity) and individualism (entropy). (vi) As represented in the last blackboard, this new community will adopt a permanent process of discussion and decision, surpassing the limitation of the present formal democracy. This open community should include not only human beings but any living creature, animal, and vegetal that is part of the creation.

The six blackboards of Rocca Paolina demonstrate the role of Beuys as a “pioneer investigator of the role of art in forging radical ecological paradigms for the relationship between human beings and the natural environment” [60]. In these expressionist blueprints, he was underlining the need of a holistic view connecting the social, economic, and environmental level, preconizing the rise of a circular use of resources and of a socially responsible economy with an equal, distributed, and democratic access to wellness to be reached and maintained without overexploiting the planet. As he stated:

“Ecology today means economy-ecology, law-ecology, freedom-ecology [. . .] we cannot stop with a kind of ecology limited to the biosphere [. . .] the ecological problem is a result of the unsolved social question in the last century. Therefore I say the only thing, which works is again a sort of enlarging of the idea of ecology toward the social body as a living being” [39].

6. Beuys’ Legacy

Beuys had the explicit aim to promote Social Sculpture as a global movement. He collaborated with Caroline Tisdall and others to explore the possibility of opening FIU sites throughout Europe. In 1974, a representative of the European Economic Community commissioned a feasibility study to assess the possible opening of a Free International University in Ireland [29]. At the end of the decade, according to Tisdall, there were branches of the FIU throughout Germany, even though these branches were political organizations rather than schools. These initiatives were designed around the FIU Manifesto mission of recognizing, exploring, and developing the creative potential of individuals. In such a way, they were political schools where new activists could be educated by the “sculptural forming” actions and could participate in the democratic construction of a new society. This process of “shaping” individuals, who should then be able to “shape” society, was a true alternative to both the existing political parties and government education: “through this lens, Beuys’s work becomes truly politically radical” [37].

The replication of the FIU model was slowed down by the shift of the German Green Party toward a more regular political organization and finally ended with the death of the artist. Nevertheless, even after his demise, Beuys has been inspiring a number of artists matching environmental and political activism with their artistic expression, such as Mark Dion, Mel Chin, Mierle Laderman Ukeles,

Lilian Ball, and Shelley Sacks [61]. In 1998, the Social Sculpture methodology was formally adopted at the Oxford Brookes University with the foundation of the Social Sculpture Research Unit (SSRU) [62], a gathering of over 150 people. Caroline Tisdall and Johannes Stüttgen opened the SSRU, establishing a direct relation to Beuys' work in developing insights, methods, and practices toward a humane and ecologically sustainable future. SSRU is presently coordinated by Shelley Sacks, who has collaborated for more than a decade with Joseph Beuys in the FIU and is presently running Social Sculpture processes and ecological citizenship projects all around the world [63]. The continuity from Beuys' to Sacks' approach is substantiated in participated initiatives, such as the Earth Forum, a mobile, open, and intensive process where the capabilities of the multistakeholder "responsible participants" are explored in front of the challenges raised by their everyday working, personal, and social life.

In a more general sense, Beuys anticipated most of the themes that can be found in the "anthropocenic art", questioning the impact of humanity on the planet in tight connection with the emerging "anthropocenic science". Among the initiatives of these last years, we can mention the event *The Anthropocene project*. A report promoted by Haus der Kulturen der Welt (HKW) of Berlin in 2014, where art exhibitions, open labs, and seminars afforded in a comprehensive and multidisciplinary approach the aesthetic, scientific, cultural, and ethical questions arising from the dominance of the human species on Earth. In 2013, the Gemeentemuseum in The Hague opened the exhibition *Yes, naturally: how art saves the world* dealing with the clash between the romantic landscapes and the degradation of the environment and suggesting by the exposed artworks, a way to change habits and save the planet. In the same year, the Ps1 of MoMA in New York hosted *Expo1*, an exhibition where the environmental challenges were connected to the actual economic, social, and political instabilities.

The artist couple Lucy and Jorge Orta have recently recalled to memory Beuys' radical wish of provoking a behavioral and social re-shaping toward ecologic awareness, thanks to the dialogue between art and science. In the *Food/Water/Life* exhibition at La Villette in Paris, they illustrated their activity spanning from the study of the Amazonas' biodiversity to art-science installations on the environmental crisis in the industrialized world and to an explorative mission of three weeks in Antarctica [64].

The relevance of Beuys and the *Social Sculpture* movement in the research of solutions of a sustainable future has also been highlighted in the exhibition *Radical Nature—Art and Architecture for a Changing Planet 1969–2009* held in London in 2009, which presented a number of multidisciplinary pioneers facing critical questions about the future of the planet. Beuys', Ukeles', and Dion's works have been selected together with the pioneering ideas of the Ant Farm architectural collective, the "planetary garden" concept by Gilles Clément, the visionary structures of Richard Buckminster Fuller, and Michael Pawlyn's biomimetic approach to building design [65].

7. Beuys and OI Methodologies

A unique characteristic of Beuys was the re-acquisition in the sense of capability of "rebuilding rather than conquering new territories, discovering rather than inventing, therapeutically improving rather than replacing" [45]. He described this search of truth, of order in the apparent chaos, as the aim of the Art-Science process of taking back reality to "a phenomenological range of human potential" (ibid.). In this sense, his action fits into the definition of the "neo-Schumpeterian innovator" as outlined by S. Winter, who is able to generate new, disruptive solutions using already known ingredients but in new recipes [66].

This creative approach is the essential kernel of the Open Innovation paradigm, which is now prevailing as the mainstream model to shape innovation, not only in the business landscape but also in the social and environmental domains [12,67], in order to overcome the limitations of rigid systems and regulation in finding answers to complex global and local challenges [68].

In the open innovation processes, the invention is substituted by the discovery; the aim of the process is challenge oriented and innovation is generated by experiments where even unreasonable paths are scouted, discussed, and verified. Disruptive innovations are primarily sought, and the aim is

to generate new radical changes that could modify the reference context, scaling from proof of concept to the global level. The envisaged new organizational model is characterized by a porous structure, with knowledge absorptive capacity and systematic involvement of multiple stakeholders.

Although these practices could be clearly recognized in the Social Sculpture movement, Beuys' legacy and his anticipating action, has not yet been recognized, especially in the field of open social innovation and its applications toward the sustainable development transition. In Table 1, we have summarized some key features of the open social innovation approach that were anticipated by Beuys' artwork and have been reported in the previous paragraphs.

Table 1. Key open social innovation features anticipated by Beuys' artwork.

Social OI Feature	Description	Beuys' Artwork Reference
<i>Participatory mapping</i>	Problems and opportunities are identified by community members as people are best placed to identify their own needs and express their own ideas or solutions.	Approach adopted in <i>7000 Eichen</i> where the sites for planting have been mapped in cooperation with the citizens of Kassel according to their priorities on requalification of areas of the city.
<i>Action research</i>	This method encourages collective problem formulation and problem solving, replacing the usual relationship of "researcher" and "researched" with a more collaborative, iterative relationship where the emphasis is on research "with" as opposed to "on" people. Users are placed at the center of the process.	The whole FIU experience has been characterized by such approach. The FIU Manifesto rejects "the idea of experts and technicians being the sole arbiters in their respective fields." They are requested to work in a "spirit of democratic creativity" together with nonexperts to discover "the inherent reason in things".
<i>Generative paradigm</i>	Along with a participated discussion, ideas lead to other ideas and the most fertile paradigms generate new hypotheses, expanding the insight and the possibilities. This feature requires a "creative ignorance" attitude, where the path of discovery leaves the knowledge maps of incremental innovation. Boundaries of fenced systems are overstepped by setting unprecedented connections through system thinking. Serendipity driven results are envisaged.	The symbolism of fat, as well as of the beehive, has been widely adopted to represent the transition from chaos to order, with the proceeding from disparate thoughts to a solid representation of a collective view. The Art-Science discovery process, substantiated by the blackboards, proceeds step-by-step from intuition to evidence, exploring possible connections and paths toward the Truth.
<i>Design thinking</i>	It is a methodology used to solve complex problems, finding desirable solutions for the users. The design mindset is not problem-focused but solution-focused and action-oriented toward creating a preferred future. Logic, imagination, intuition, and systemic reasoning are combined to explore possibilities of what could be and to create desired outcomes.	The Social Sculpture process anticipates the design thinking features. Especially in FIU workshops, a set of problems (global and local ones) were selected and proposed. Participants were asked to offer possible solutions arising from their knowledge, skills, and intuition. Organizers were facilitating the process, setting the conceptual framework, animating, and facilitating selection of the most promising ones and their further proceedings.
<i>Community-building actions</i>	A group of people is driven to recognize a common goal regardless of the diversity of their backgrounds. Open and effective communication is set toward the common goals, establishing a sense of reciprocal safety.	We have reported the <i>Piantagione Paradise</i> project where the need of regenerating biodiversity has been shared with local communities that have been fully involved along the process.
<i>Promotion of individual creativity</i>	Individuals are stimulated to share their knowledge in a creative, collective effort. Intrinsic passion and interest in the goals are used as triggers, self-confidence is promoted in a nonthreatening, noncontrolling climate. Combination and recombination, such as the "intersection" among individual capabilities, is incentivized.	This is one of the most distinctive features of the Social Sculpture. Everyone can contribute to change and self-determination, transforming the everyday acts of life into an artistic act by combining physical and spiritual material. The scope of education and performances is essentially to promote this attitude.

Table 1. Cont.

Social OI Feature	Description	Beuys' Artwork Reference
<i>Crowd-based approach</i>	It can refer to “in-kind” contribution (crowdsourcing, as the practice of obtaining needed services, ideas, or content by collecting contributions from a large group of people) and “in-cash” contribution (crowdfunding, as a financing method to fund a project with relatively modest contributions from a large group of individuals, rather than seeking substantial sums from a small number of investors).	The Social Sculpture actions have been supported by a large in-kind contribution, in terms of shared knowledge, time and workforce. Crowdfunding of large scale projects has been implemented through the collection of contributions in exchange for small artworks. In the <i>7000 Eichen</i> project, in addition to the initial funding provided by Dia Art Foundation, further sources included individual tree sponsorships, donations from many other artists as well as significant contributions by Beuys himself.
<i>Multidisciplinarity</i>	It is the attitude of combining several academic disciplines or professional specializations in an approach to a topic or problem.	Events like <i>100 Days of Free International University</i> are fully coherent with this feature. Participants and invited experts were coming from different disciplines and professional domains. The approach adopted for the discussion was topic oriented, mixing the different contributions during the “search for truth”.
<i>Disruptive and scalable innovation</i>	Disruptive innovation is the introduction of a product, service, or operational model into an established field where it performs better than existing offerings, thereby displacing leaders in that particular field. Scalable, even exponentially, solutions and organizations are expected and promoted. The assumption is that if a problem has been solved by someone and the solution works, it should be globally scaled up.	Beuys is affording global challenges, and his action is aimed at establishing a symbolic reference and an open methodology to scale-up. In the <i>Defense of Nature</i> , replantation artworks are just the beginning of a global action extended to the regeneration of the whole planet.

It must be underlined that Beuys’ legacy maintains its uniqueness in terms of an original combination of open methodologies, social engagement, and radical ecological goals. Beuys has been recently considered a forerunner of the radical Occupy Wall Street movement [69] for the anticipation of some of its collaborative approaches in organizing the protest against financial power and involving artists in representing reasons for the unrest. Nevertheless, this represents a limited acknowledgement of the artist’s legacy, which is not yet exploiting the lesson of embedding art (i.e., individual creativity) into an open process when searching for alternatives to the dominating and unsustainable system.

We consider Beuys’ obsessive attention for the engagement of individuals around a core set of values, a truly distinctive feature of its philosophy and a point of reference for understanding and improving the actual social open innovation dynamics. As a matter of fact, they rely upon collaborative organizational structures and behaviors, but “revolutionary” individuals—the “social entrepreneurs”—are usually pivoting the change, catalyzing the available energies around the transitional actions. The concept of “social entrepreneur”, introduced by Banks in 1972 [70], in the context of the sociology of social movements, has been fully expanded in the Beuys’ direction of individual creative engagement, which can be clearly recognized in the motto “*everyone a changemaker*” coined by William Drayton, founder of the global network of social entrepreneurs Ashoka [71].

In the OI framework, the new ventures that were started by these game-changers are considered an appropriate link from the experimentation process to the society. According to Curley and Formica: “*innovation is knowledge turned into action through creative endeavor that hugely depends on the willingness to start new companies*” [72]. The entrepreneur is also promoting a discovery process in the science domain in order to find the appropriate knowledge needed to trigger the transition (ibid.).

In this context, an upcoming generation of innovative entrepreneurs who promote nonconventional solutions for the most urgent environmental challenges is emerging around the world. We can mention, among others, Boyan Slat, a young Dutch entrepreneur who was able to catalyze a huge network around The Ocean Cleanup venture [73] with the “unreasonable” idea to clean the Great Pacific

Garbage Patch, which he plans to half in the next five years; Dave Hakkens, who launched Precious Plastic [74], a global open source movement to apply creativity to the distributed regeneration of plastic waste; Lewis Horne, who has created from scratch Uniti [75], one of the most appealing projects for a radical eco-innovation in the automotive sector, making leverage of both technical and marketing open creativity along with participatory design processes.

As in Beuys' vision, "will" is the engine that drives creativity into the transformation of the economy. Thus, the innovative social ventures, flourishing in the open innovation field, could be seen as a new declination of the Social Sculpture action, where the creative attitude of a multidisciplinary team of individuals is "shaped" by the entrepreneur who is scouting the paths toward a globally scalable transition. Thus, we recognize a formidable source of inspiration in Beuys' work for innovative social entrepreneurs who are embracing the Sustainable Development Goals challenges. They should consider themselves "artists" in Beuys' sense, being part of a global open and cooperative movement—a global "beehive" without distinction of disciplines and specializations—of creative individuals engaged to build a better future. Pier Giorgio Perotto—who led design of the first personal computer—affirmed that: *"the world needs poets, scientists, entrepreneurs generating fertile and prolific variances, who operate as systemic creators [. . .], really embracing the creative schumpeterian destruction"* [76]. Joseph Beuys still has many things to teach them.

8. Conclusions

The long-term Beuys' legacy can be found in his ability to implement pedagogic, change-making actions centered on the empowerment of individuals through creative development, with a counter-institutional vision to be brought into a global perspective to address both social equality and preservation of the natural world in a holistic approach [77–79]. He tried to stimulate the interconnection of people to generate a positive change in defense of nature and against the alienation of humanity. His terrain of intervention was Bateson's *"ecology of mind"* [80], the ability of creating situations—at a room, city, or global scale—empowering people's capacity, willingness, and ability to imagine alternative and desirable futures. *"Art is the image of man himself"* (see Figure 5) and of the power to change the world that is hidden in everyone. Paraphrasing Walt Whitman, Beuys' work shows everybody the concrete opportunity and urgency to *"contribute a verse"* to the *"powerful play"* of ecological transition.



Figure 5. Beuys' portrait on a tram in Düsseldorf with his famous sentence *"Die Kunst ist das Bild des Menschen selbst"* (Art is the image of man himself) [81].

As he claimed, it is time to shift from a short to a long-term view, exploring our creative and entrepreneurial potential for a great collective step toward a new evolutionary stage of humanity that is characterized by a holistic view of society, economy, and nature. As a true artist, he really anticipated our time and, in particular, the emerging global generation of social innovators who are trying to afford the challenge of sustainability in the open innovation framework. In this light, Beuys' whole artistic philosophy and production should be further investigated in order to increase the awareness of the fundamental role of art and humanities, together with science and economy, in this crucial phase of human history.

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Article

Art Hacking for Business Innovation: An Exploratory Case Study on Applied Artistic Strategies

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Abstract: Despite a growing interest in the effects of arts-based interventions on organizational change, concepts aiming at business innovation and product development other than residencies are rare. Furthermore, little is known about the role and impact of artists involved in idea-generating formats. How does the personal presence of artists in a heterogeneous working group influence the procedure? To what extent do artists unfold their creative qualities while dealing with such a non-artistic challenge? The paper introduces a method named Art Hacking that applies professional labour attitudes typical for artists and artistic modes of thinking to business problems and enhances the approach by having artists attend the whole intervention. One of these events was taken as a case for exploring the role of four artists in the collective idea-generation process. The results of participatory observation along critical incident technique substantiate the thesis that in interdisciplinary “playgrounds” artists implicitly become process leaders. They are catalysts for awareness, sensemaking and change of perspective.

Keywords: Art Hacking; Art Thinking; arts-based intervention; creative leadership; innovation; idea generation

1. Introduction

In a complex and rapidly changing business world in which planning is falling to growing uncertainty, creativity has become a key resource [1,2]. “Wicked problems” as discussed by Rittel and Webber [3] (p. 160) cannot be solved by rational, analytic approaches. When proven action patterns malfunction, approaches that help to develop novel, future-proof ideas are required.

As “art is a question and an attempt to answer it” (Alicja Kwade, visual artist) [4] (para 16), artists are used to coping with uncertainty and well adapted to moving in complex environments. The artistic process is about exploring unknown paths, radically changing directions if necessary, making detours, abandoning failure and starting anew. Artists are working with methods that differ from rational, systematic management procedures by candour, mindfulness and intuition [5,6]. As artistic labour reaches far beyond analytical methods, artistic attitudes open different interpretations of reality (sensemaking) [7,8].

Discussing the relevance of the artistic process, Grant notes that artists are able to master ambiguous, uncertain situations with “unregulated inspiration, . . . and a lack of rules and limits” [9] (p. 9). Inventive rule-breaking as an essential artistic guiding principle is supposed to start innovation in business contexts just the same. Artists are turned into role models: “Like artists, business people today need to be constantly creating new ideas. As we enter the 21st century, organizations’ scarcest resource has become their dreamers, not their testers”, Adler claims linking artistic qualities to leadership [7] (p. 492).

Applying the arts to business environments is supposed to add value to corporate identity and branding, to leadership, human resources development and organizational change [10–12]. Companies

involve artists in strategic development [13], entrust them with operational activities, such as in brand communication [14] or simulate workflows common in performing arts [15]. In project and product management, the self-organization within ensembles has inspired agile methodologies like scrum in software development.

Since the end of the '90s, arts-based or artistic interventions respectively have established themselves in organizational and personnel development. In their most widespread form, artists have company staff pass through a creative process based on the visual arts, the performing arts, music or poetry [10,16,17]. The different approaches usually aim at improving problem-solving skills and the development of key competencies particularly with regard to social skills. The empirical research at this intersection between art and business focuses both on presumed individual effects (see, for example, [18]) and organizational impact (see [19] for an overview).

Arts-based interventions that are more ambitious and putatively sustainable range from coaching [20] to residency [21]. They are meant to initiate a system change within the organization. In fact, the support of corporate change and a positive impact on the capability for innovation belong to the most prominent empirically based effects of arts-based interventions [12]. In this context, it is noteworthy that for the academic discourse on arts-based interventions as well as for the approach itself a western understanding of creativity is formative. Eastern cultural traditions prioritize collectivism and usefulness. According to western traditions, however, creativity tends to be associated with individuality and is commonly equated with novelty, originality and innovation. From the western point of view, creativity is closely linked to problem-solving [22].

Manifestations of collaboration between artists and companies that target a mutual transfer of knowledge and innovative practices seem to be less prevalent than interventions for staff and organizational development. They are a blind spot of empirical research—despite their long historical tradition in engineering and technology. There are well-known examples for successful residency programs but none of them has turned into an object of research.

Technologists at Bell Labs have partnered with artists for more than 50 years. Within the scope of Experiments in Arts and Technology (E.A.T.), nine performances emerged involving big names like John Cage, Lucinda Childs and Robert Rauschenberg. The Arts/Industry residency program hosted by Kohler Co. has been fostering exchange since 1974 with the participating artists stretching technical boundaries engineers and craftspeople would not have turned to. During PAIR (PARC Artist-in-Residence), the artist in residence program Xerox PARC (Palo Alto Research Center) established in 1993, artists and scientists were working on similar ideas or shared materials and methods. In 2013 Microsoft started studio99, a project that has granted artists access to technologies and know-how ever since. The resulting artworks are presented in a gallery space maintained by the company's research and development division.

Bosch recently had two artists arrange a whole floor as an unpredictable and challenging experimental space at its research campus. To the artists it is "no idea machine but a place that is putting out questions" [23] (p. 578, translation from German by the author). In between misset clocks and other irritation objects on platform 12, employees commit themselves to Design Thinking. Visiting artists, who independently create their own works in reaction to these surroundings, are constantly challenging the Bosch researchers by their mere presence [23,24].

Whereas there is a growing pool of research on the mechanisms of action of arts-based interventions (see [19]) and learning (see [25]), aimed studies on artistic activities in research and development or business innovation are rare. That is particularly true with respect to the role artists play in collaborations that are meant to support product development or idea finding for organizational issues (see [8,26]).

The potential of collaborations lies in the disclosure of implicit knowledge. Artists do not have the same perception as managers and construct knowledge differently than engineers would. For the company hosting a residency, the artists' intuition becomes a resource that opens up new vistas on working contexts and points out alternative courses of action [8]. Artists encourage new ways

of thinking, when they interfere as “artistic agents” [23] (p. 558, translation from German by the author), who are constantly around, reflecting and commenting on the situation. On the other hand the encounter of artists and employees is causing friction [23] and due to cultural differences, there may be communication problems the actors have to overcome [26].

Other than such general observations and propositions there seems to be little evidence about artistic behaviour in situations that are meant to spark innovation. Artists are introduced as moderators or facilitators of arts-based interventions or creative labs and the course of their intervention is described (see [13,23,26,27]) but it remains unclear what is genuinely artistic in their approach and behaviour.

Against this background, the aim of this paper is twofold. Firstly, it will introduce Art Hacking, a creative method that is based on artistic strategies and work attitudes. Secondly, it will explore if and how artists demonstrate profession-specific attitudes in dealing with non-artistic assignments. The elements of Art Hacking provide the conceptual background for the examined case: an intervention with the participation of four artists aiming at idea generation for a business problem. The case is used to go into the following research questions on the roles of artists in business innovation.

How do artists operate in a collective idea generation process with heterogenous actors? How do they unfold their individual creative personality competence in an unfamiliar professional environment? How do they apply artistic strategies such as gathering, irritation, improvisation, alienation and derangement [28] to a non-artistic subject? Which typical professional behaviour patterns are shown beyond individual idiosyncrasies?

The answers to these questions are supposed to provide clues for arts-based intervention frameworks with goals like innovation or organizational change. Does it make a difference if the artist is present?

2. The Conceptual Framework of Art Hacking

2.1. Core Idea and Theoretical Background

The intervention format Art Hacking, which was created by the author, aims at collective idea generation and the development of solutions for complex, possibly socially constructed business problems afflicted with uncertainty, which from a management point of view cannot simply be solved with common economic tools.

In a workshop for Art Hacking, groups of multidisciplinary stakeholders and artists from different genres work on a business problem that the participating organization brings in. The process is set off in a laboratory-like environment, which ideally includes inspiring architecture and allows for a change of location. In this respect, the design of Art Hacking is based on four insights from innovation research.

- (1) Diversity in teams stimulates divergent thinking and fosters idea generation, because different perspectives collide [29,30]. From different angles, novel questions and new meanings emerge [31]. Collective mindfulness allows for a perception of significant details, which have been overlooked before [32].
- (2) In every innovation process space is essential. Temporarily relocating staff from their usual workplace to physical environments that are designed for creative confrontation makes idea generation more effective [33]. Innovation labs as well as other creative spaces need to be adaptable places for communication and collaboration with strong elements for the wellbeing of diverse users [34].
- (3) Materials have an intermediary function. Visualizing situations and organizational procedures can lead to a more profound understanding of the problem at hand [8]. By sketches, prototypes, movement phrases and other means of expression, players not only can test novel solutions but also enter learning paths while exploring alternative opportunities step by step [35]. Playing with material and its potential symbolic power as well as a non-verbal encounter with fellow players will open a different view on reality than a primarily rational, merely linguistic discourse [36].

- (4) There are necessary conditions for emergent innovation, meaning radical change. These are certain attitudes, values and behaviours such as openness, perceptive faculty, reflectivity and the ability to recognize the “right moment” [37].

The latter point is key for the method presented here, as it is artists who are gifted with all these traits [38]. The core idea of the approach is to apply artistic attitudes and ways of dealing with an issue to problem-solving in a non-artistic environment. Insofar, the approach is both an instruction for idea generation and a training in artistic strategies. In this context, the immediate participation of artists in the process is supposed to facilitate access to artistic attitudes for other participants.

Apart from positive side benefits to human resource development, Art Hacking is a chance for organizations to incorporate the expertise of outside parties (artists, scientists, customers, etc.) in organizational change or product development. As regards the latter, a joint Art Hacking workshop can be part of an open innovation strategy serving an outside-in process. In general, the approach aims at business innovation in the sense of improving or even inventing processes, products, or services. By targeting idea generation however, it is limited to the very first stage of the innovation process.

2.2. Objective and Philosophy

The basic idea of the intervention is to convey artistic working styles to members of other professional groups and to apply characteristics of the artistic process to a business problem. The solution for the problem, the relevant ideas or a final concept respectively are quasi the work the players are creating together while they are exploring and solving the matter.

The method simulates the artistic process: picking up on an issue, doing preliminary research and conducting a dialogue with the material without preconceived views as to its outcome [39]. Artists choose a motif or an issue they love to explore but they do not have a clearly defined objective in doing so [28]. Artistic labour is about finding solutions in “non-linear explorative movements” [28] (p. 127) and on creative roundabout routes. In the words of composer John Cage “the residual purpose of art is purposeless play” [40] (p. 71).

An arts-based intervention is not purposeless in its nature even if its course and outcome are unpredictable. Adopting artistic strategies to idea generation and problem-solving has if any at all connections to applied art. However, the playful, sensuous approach is an essential feature, because “ideas are discovered by intuition” (Sol LeWitt, visual artist) [41] (p. 79). Art Hacking initiates a process, in which artistic attitudes and strategies are used to solve creative challenges without going digital though.

Basically, the word “hacking” refers to a technique for doing or improving something. The term has its roots in journalism referring to unorthodox methods. It spread to computing and is currently transferred to areas such as cultural change and the arts [42,43]. In the artworld, hacks “have been used . . . as a strategy to generate discourse, collaboration and a starting point for new artworks and ideas” [44] (p. 27). However, those hacks are usually about building digital prototypes from specific arts data sets [44].

Hacking is associated to creatively improvised solutions and a targeted undermining of patterns and attribution of meanings. It is about ignoring rules and rewriting them in favour of innovation. Therefore, a typical hack will combine the serious game with playful seriousness and an experimental, tinkering approach. A hacker is a person who explores a foreign system and finds his way in it thus being able to implement a disorientation and initiate new structures without predetermining their precise features [42]—a working principle that strongly resembles the systemic nature of arts-based interventions in business.

In idea generation, letting go of rules and routines and making up new ones is of similar importance as in a genuine artistic process. Therefore, there are elements in Art Hacking that encourage participants to leave their thinking patterns aside, bend reality and sound out alternative solutions they would not have dared to even think about in the beginning. The format shall set up a space for purposeful play and divergent thinking [45].

In this space, experimenting is meant to be safe, although expectations of clients towards the players may be high. Aiming at a certain outcome would not correspond to artistic attitudes. Even if they have to subject themselves to time schedules of rehearsals and are working towards the premiere, performance artists do not expect something predefined to happen in a given timeframe or predictable order [39]. They “trust the process” [46]. As with artistic labour itself the artistic intervention entails the risk of failure. Clients need a minimum of courage to take the plunge into the experimental arrangement.

In order to minimize this risk, the different stages in the process are scripted. Art Hacking has a certain sequence of elements that may be varied, switched and even skipped sometimes if the situation or the progress of the working groups require adjustments. The elements are chosen and arranged in a way that seems most suitable for the issue. For instance, if the workshop is essentially about leadership other film footage and image material will be used than if the matter was customer communications. However, the participants do not receive any schedule or detailed information on the process sequence before and during the workshop in order to have them experience the uncertainty of being in an open-ended and unpredictable creative process full of surprises.

At every stage of the process, the participants are confronted with tasks that are supposed to convey artistic attitudes and/or meant to foster an in-depth reflection and debate about the issue. In order to establish the next step in the process, each assignment is introduced by a story about the genesis of an artwork or by statements from artists who comment on a certain phase in their labour. These examples are implemented in the plenum as well as flanking rituals (varying welcoming and farewell routines) and energizers (active breaks). The assignments are elaborated in the working groups or in even more fragmented constellations through to pair work. Within this frame, specific activities of participants and the interaction within the working groups are free to unfold.

The tasks the players have to complete explicitly refer to artistic strategies such as deconstruction, reversal, improvisation, cut-up and chance operations. The players are using dictated artistic media that may support or undermine their almost unavoidable verbal discourse. The permanent change of work techniques and varying content-related approaches results in a change of perspective. Both the issue and possible solutions are patiently and persistently turned back and forth.

The joint quest is not finished when the first viable idea appears. Ideally, it is pursued for several days. Participants usually reach solutions that are more inventive this way. Experience shows that the starting problem always recedes into the background during the process and gives way to a fundamental question, the players were not able to see in the beginning. This question will lead them “out of the box” and to more original and sometimes even disruptive solutions.

Although Art Hacking does not claim to be a variety or a distant relative of applied arts, it latches on to the view that other than design art is not about solving problems but “finding solutions for questions yet unknown” (Daniel Richter, painter) [47] (para 27, translation from German by the author).

2.3. Process Sequence

Artistic labour never begins with a cold start. An ensemble will start their rehearsal process by warming up so as to focus and tune into each other [48]. Visual artists have similar rituals for getting connected with the task they address themselves to. The next step of the process is an in-depth analysis of the chosen issue or the material, respectively. It is a playful, explorative and non-linear questioning [28,39]. Based on these insights, the artwork is formed organically in a constant interplay of tentative action, perception and reflection—a process in which the space of possibilities gradually narrows. The artwork is finished when a harmonious expression is achieved [39]. In performance arts, this is not necessarily the date of the premiere: often artists will continue filing after the first performance. Visual artists usually let their work rest and finally abandon it while presenting it to the public.

Art Hacking picks up on these stages but leaves them as overlapping, as they are in a genuine artistic process. The format has five phases during which solution approaches for the given issue

are developed: attunement, creative research, single-minded play, composition, and showing (see Figure 1). These phases are not strictly separated. Some explorative tasks are only introduced at the third stage and there are tricks to keep both the penultimate stage playful and to overcome blocks.

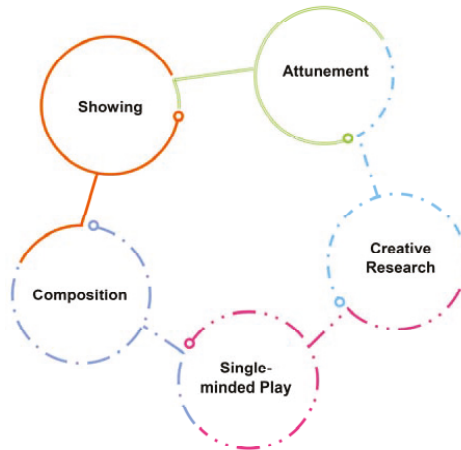


Figure 1. The process sequence of Art Hacking.

The five phases are described below. Each passage is illustrated by an artists' quotation that reflects a typical attitude to the respective part of the artistic process to be emulated. Empirical studies show that other artists usually share these attitudes regardless of their genre or reputation [38,39].

Phase 1. Attunement

The great thing about the band was that whoever had the best idea (it didn't matter who) that was the one we'd use. (Ringo Starr, musician, on The Beatles) [49] (p. 241).

The radar is on whether you know it or not. (Keith Richards, musician) [50] (p. 183).

At the beginning of the joint work, the participants are transformed into an ensemble-like entity. Meeting each other without prejudice is more important, the more heterogenous the group is. The first objective at this stage is to have the participants develop mutual trust and esteem for the different qualities they are bringing in. Targeted team building activities shall equalize any difference in status and sensitize the players in taking turns as leader and followers. The participants are invited to reflect on the actual and the desirable distribution of roles within their working group.

The second objective of "attunement" is to focus, sharpen the senses and invite intuition. Suitable training tasks, which address different levels of perception, support attentiveness. Moreover, there are exercises in depicting, listening and understanding for improving the dialog capability and avoiding killer phrases.

A simple creative exercise with a minimum of rules allows the players to experience an inventive process that has no preconceived result. Each player is asked to transform a cheap everyday object whose form and material composition will prevent a functional, assessable solution. This exercise is a foretaste of the open process that is to follow.

Phase 2. Creative Research

You're doing research. You're exploring, in the really deepest sense. When I start to work on a piece, I talk to people, I read. (Meg Stuart, choreographer) [51] (para 11).

Anywhere I ask the dancers questions . . . and everybody thinks about them. . . . Initially, all this together is only a material, a collection of material, yet it is not a piece at all. (Pina Bausch, choreographer) [52] (p. 92, translation from German by the author).

The real process of idea generation starts with creative research on the issue. Participating representatives of the organization introduce the problem in small groups. This very first input is not given by a classical presentation but in the form of a controlled dialogue in order to deepen mutual understanding and to avoid premature interpretations.

Afterwards, the players actively explore the issue. The most important tool for drilling out the problem is to ask consecutive questions without answering them and to follow just the crucial questions later on. The players gather information on the problem, including approaches that have not worked in the past.

Similar to a process of artistic inquiry, the players are requested to visualize the problem. They may work on a common collage, a sculpture or some other form of visual expression. In search of a suitable shape they are getting to the bottom of the problem. The object will probably uncover aspects that were underrated or out of sight beforehand, as well as bringing irrational influences to light.

The creative research results in a common understanding of the problem within each working group. As this phase partly overlaps with the next one—single-minded play—the players are usually working on the obvious symptoms first, before they get to the real cause of the problem. Since this insight is more a flow than a moment, it is unpredictable. It is rooted to the act of decentration: while turning the gaze away from the starting position its meaning will change.

Phase 3. Single-minded Play

Mostly I will do the work that I am afraid of. If I am really afraid of an idea this is exactly the point I have to go. (Marina Abramović, performance artist) [53] (4 min, 14 s).

You always reach for the easy solution before you, in defeat, submit to the more difficult solution. (Jonathan Franzen, novelist) [54] (p. 45).

The first assignment for the participants in the so-called single-minded play phase is gathering ideas between two workshop units without evaluating them. This is brainstorming outside the group, so to say. Back at the workshop, the challenge is not to take up the first agreeable idea that comes along. Therefore, the discussion begins with the rejected ideas the players did not even note because they seemed weird or unfeasible and then expanded with the presumably good ideas. With the help of deepening questions and a successive comparison of alternatives, the idea pool is downsized.

The players continue with selected ideas and are working on the approaches in a mode of purposeful play. The objective of this stage is to be prolific and to produce material. The participants shall find different solution variants to play with. In doing so, improvisation principles are helpful. Other than a destructive “Yes, but . . . ” an open attitude will expand the potential space of possibilities. “Yes, and . . . ” means accepting whatever another player states and to expand on that line of thinking by adding new information or insights.

Improvisation is only one of several artistic strategies the players are taught to apply during the process. They are encouraged to abandon premises, question everything, break patterns and disobey rules. By changing restrictive framework conditions and parameters of the situation, in their minds they will imagine solutions that are feasible.

Each element at this stage is an arts-based impulse fostering fluency. The players are urged to alter the familiar and change definitions. They use metaphors and indulge in absurd analogies, such as envisioning the organization and its environment as a zoo. In addition, there are random irritations that distract them from linear, convergent thinking. An example for combining incompatible things is to integrate a term like ‘sauce thickener’ in an emerging concept.

Phase 4. Composition

Ideas flow out of work. You open a door, you are looking around. And if you do not like it, you shut the door and open the next one. (Chuck Close, painter) [55] (p. 54, translation from German by the author).

Sometimes adding words or verbalizing an idea is actually counterproductive . . . So sometimes I just make a model. (Olafur Eliasson, visual artist) [56] (2 min, 11 s).

In the next-to-last stage, particular ideas are elaborated and merged into a concept. The players file the elements of a procedure of gradual refinement. The fourth stage marks a state of continuous reflection and doubt as well as a procedure of gradual refinement. The approaches are meant to be condensed and reduced to the point while the concept is visualized as a collage, sculpture, installation, storyboard or mini drama. The artistic maxim at this point is: "Kill your darlings!" Despite positive experiences with the format, it cannot be ruled out that the process ends in an act of complete destruction and will start over at an earlier stage or begin completely anew.

Phase 5. Showing

Each exhibition is . . . an inspection. Will my work last? (Thomas Schütte, visual artist) [57] (para 35, translation from German by the author).

I change things in each performance series. I skip breaks, I shift sequences. (Sasha Waltz, choreographer) [58] (para 11, translation from German by the author).

Depending on the timeframe of the workshop, the stages of composition and showing are more or less intertwined and extended. Showing may refer to the presentation of a draft to other participants or uninvolved external persons who are confronted with the embodiment of the idea and engaged in conversation. Based on the criticism of the draft and a possible exchange of ideas, a refined solution and another object are developed, respectively.

Other times showing may mean just a single presentation. With a tight schedule, the reality check is skipped in favour of a display among the participants, followed only by a debate of the different ideas in the plenary.

3. Methodology

As the theoretical and empirical state of knowledge about artistic behaviour in non-artistic settings was low, the present study pursued a descriptive-explorative objective. The qualitative research approach allowed hypotheses on the role of artists in arts-based interventions to be developed [59].

The study is based on a case the above-described approach of Art Hacking was rolled out into. In other words, a given concept was applied to the case according to the above-mentioned sequences. The starting point for the arts-based idea-finding process was an unsolved problem that a big provider of child day-care establishments introduced: How can you encourage parents to engage in voluntary activities in the establishments and have them participate in joint efforts for child education in big cities? As four artists were working simultaneously on the issue, the case promised rich and concise information (homogenous sampling) [60].

24 people joined the five-day workshop, which took place in Berlin, Germany. In each of the six-person groups that were working on the issue in parallel, one or two staff members from the central administration, two (leading) educators from day-care centres, one or two parents, one business student and one artist were always, continuously participating.

Artist 1 is a painter. Visual artist 2 has a focus on sculpture and installation art. Artist 3 is trained as an actress, mime and dancer. Artist 4 is working in improvisation theatre. All of them have worked in their artistic profession for more than ten years and possess appropriate experience and expertise. Only artist 4 is a parent who has experience with a day-care centre.

Before the workshop started, the artists had been asked to participate actively but they had not received beforehand any information about the five stages of Art Hacking, process details or specific tasks. They knew the arts-based philosophy of the approach and the issue in broad outline but not any work step or assignment given to the participants. Their role in the format was vaguely described to them as facilitators and reduced to a “Just be yourself!”

The research team consisted of the author who moderated the workshop, an assistant that supported the event and deliberately observed the happenings and the above-mentioned students. These were actively working on the issue and their assignment as observers. In order to enhance the necessary objectivity during the participatory observation, the author stayed out of the collection of data and the assistant was not involved in the work process of the participants other than setting its frame. With the exception of two students, all members of the research team had some experience with the format and other participating artists, which favoured the awareness of interesting behavioural aspects.

For structuring the observation and analysing the collected data, the critical incident technique after Flanagan [61] was used. Originally, the critical incident technique was designed for creating job profiles but it can be applied flexibly to other social-science aspects as well. The essential methodical element is a semi-structured questioning technique: Test persons report on situations in which individual behaviour had any positive or negative effects on the main goal of the activity in question. Thereby, key behaviours are identified and categorized [61].

Accordingly, both human behaviour and its significance for other actors involved were considered during the arts-based event. The objective of the analysis were the approaches the artists applied during the event and the role they played in their working groups. The artists’ expert status is proved by their professional self-conception and experience.

With regard to the requirements for defining critical incidents (see [62]) 17 longer sequences in the workshop format were determined as relevant situations. Each of the chosen sequences was related to an explorative and/or creative assignment for either the small groups or the plenum, which was supposed to promote solutions to the issue. It was assumed that artistic behaviour patterns of interest would show at these points in particular.

The rule of not letting the participants know anything about the process sequence (see Chapter 2.2) had to be eased in favour of participant observation. With the critical incidents both the assistant and the student observers had a rough outline of the workshop at hand. Thus, they knew about the consecutive stages of Art Hacking but were asked not to share this information with other participants. The students received a short questionnaire for capturing artistic approaches and positions:

- When do the artists interfere in the process?
- What do they do?
- How do they proceed?
- What consequences does their behaviour have for the working process?
- What role do they play and what effect does that have on the small group?

The participating observers were asked to outline the situation as well as to give a detailed description of behaviour and its effects on process and fellow players for every critical incident. Immediately after the workshop, an in-depth group discussion with the observers took place, methodically derived from a behavioural event interview [63].

The minutes of all five observers and the content of the group discussion were supplemented by anonymous, short written statements of non-artistic participants. Near the end of the workshop, these were requested to name situations and related activities of the artists that were striking from their point of view, as they differed from attitudes of other participants and/or promoted the process in a special way.

The written material underwent a thematic content analysis in order to categorize the observations made at the critical incidents. Categories are “groups of work behaviours that share some common

theme” [62] (p. 1128). In order to objectify the findings, the observations were broken down independently by two persons at first, namely the author and her assistant. Starting from that, a pattern of main and subcategories [61] emerged.

4. Findings

4.1. Overview

Although the artists who participated in the workshop come from diverse art forms and seemed to be different in their personality in terms of extraversion, there were strong parallels in their individual behaviour. The aspects that appeared with all of them and repeated independently from the individuals at various points in the process can be mapped in two dimensions.

The first dimension represents interaction. Interaction has two levels: on the one hand the interaction with the issue and on the other interaction with fellow players. From an artistic point of view, interaction with the issue is the dialogue with the material out of which an art work arises. In the given context, it refers to handling the task, dealing with ideas and working with media in order to visualize solutions. The interaction with fellow players comprises any behaviour within the group or towards other participants during the process.

The second dimension represents three different aspects of doing. These are perception (information acquisition from the environment), reflection (scrutinizing, comparative consideration) and action (targeted activity including communicative action). In combination with the two levels of interaction, a grid of six categories arises (see Figure 2) the findings are displayed in.

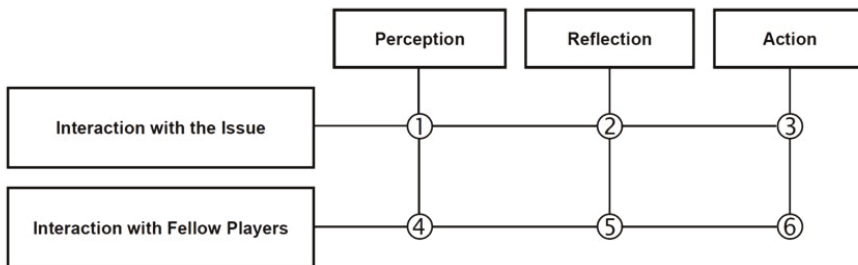


Figure 2. Dimensions of artistic behaviour during Art Hacking.

4.2. Findings on Interaction with the Issue

Category 1. Interaction with the Issue/Perception

The first category comprises sensory and cognitive perception relating to the issue and to (visualized) ideas, as far as it showed up in observable characteristics or behaviour.

The other participants described the artists as exceptionally alert and sensitive. The artists were observing intensely. However, it was noticeable that they often paused for a moment to take in impressions of the situation. In these minutes, they seemed to be slightly absent, cautious and thoughtful. It was the artists who were the first to perceive the change of the central problem.

The artists had different views and information filters. Whereas artist 1 always tried to see the big picture, artist 4 was attentive about little things. Artist 2 and 3 switched between overview and attention to detail.

Category 2. Interaction with the Issue/Reflection

The second category includes observations on how the participating artists processed information and sensory impressions and how they penetrated aspects intellectually and emotionally.

All artists handled impulses with unconditional openness. They welcomed every single idea, accepted and recorded it. There was no “No!” to them, no right or wrong. They were wary of premature evaluations or spontaneous refusal and played with the thoughts instead. The artists picked up all ideas and worked with them. Their reflection followed while they were dealing with a proposition.

The artists’ behaviour in a field phase is particularly noteworthy. At stage 5 of Art Hacking (showing), the working groups were prompted to obtain feedback from bystanders. Other than the other participants, the artists were not frustrated by negative comments on the draft at all. To them the criticism was important input that made them get back to work and enabled them to get closer to a sound solution.

I still have so many questions! (Artist 2)

Every artist had a strong disposition to scrutiny. The artists enjoyed asking questions and in fact not only with the workshop elements that were meant to explore the core. Each had a different speed in developing questions; Artists 4, the improv player, was in her element and very quick. But all artists alike demonstrated analytical strength while asking prudent, profound questions—especially in stage 2 of Art Hacking (exploration) when it came down to accumulating questions.

The other participants tried to identify limits in order to obey any rule. Analogously: What are we allowed to do and what not? In contrast, queries from artists aimed at a better understanding of facts or the significance of a particular task: What does that mean? The artists scrutinized ideas and pointed out alternative meanings of an approach.

They questioned the meaning of facts and were aware both of different interpretations of reality and of possible consequences of certain views, including the unfavourable ones. All four had a distinct sense of imagery. The two actors (artists 3 and 4) stood out with their efforts to clarify the meaning of terms and state messages more precisely.

I don’t like it that way. This is not consistent yet. (Artist 4)

In the beginning the artists moved away from the supposed problem with their questions and opened up new perspectives. But later on, they repeatedly returned to the core and refined the solution in continuous reflection. In an advanced stage, they asked a genuinely artistic question: Is it consistent? When visualizing ideas and concepts, the artists did not hesitate to scrutinize approaches their fellow players had already agreed upon. Despite (or actually due to) being unfamiliar with specific business problems in their everyday working life, they played the role of neutral observers whose reflection process stimulated reflections with their fellow players.

Category 3. Interaction with the Issue/Action

The third category accumulates activities with regard to the issue and tasks in the process, respectively. It includes communicative activities like phrasing an idea or commenting on the thoughts of others.

One especially pronounced activity to be observed with the artists was documenting information and ideas. The two actors (artists 3 and 4) did so during the whole process; artist 2 at times. They took notes and made sketches for themselves but recorded for the group as well by visualizing the process and its interim results. Artist 1 worked on the written reminders of his group if they lacked structure.

Apart from that, the artists stood out by their inventiveness. They did not wonder very long but followed their intuition and communicated instant thoughts more often than other participants. Frequently they were the first ones to come forward with a proposal on an assignment. They were not reluctant to express spontaneous ideas nor afraid to dismiss unsuitable ideas after a while.

In general, their ideas were wittier and more original. Other participants commented on this in statements like: “Nobody else would have come up with such an idea.” The originality of their thoughts was particularly significant at the task to retrieve ideas they had turned down when they

sprang to their minds because of their absurdity. While looking for analogies to the issue, this showed as well. Whereas other participants thought of a retirement home and a university, the artists suggested replacing the child day-care centre with a church, museum or zoo.

The artists were obviously moving beyond common ways of thinking. Given that they constantly changed thinking directions, the atmosphere within the groups relaxed. With unconventional ideas, both on the matter or working process the artists encouraged other players to leave their thought patterns and play with unusual ideas, too.

You will find ideas along the way. (Artist 2)

The artists took up unpredictable impulses and ideas of others and guided the groups through a gradual process of content related concentration. Not only did they approve other ideas but reinforced them by verbal repetition. They picked up ideas and elaborated them by complementing a point or linking it to their own considerations.

Sometimes the artists consciously tried to distract the others from a certain aspect and open the space of possibilities. Later they led them back to the matter with fresh ideas found on the detour. To avoid getting bogged down in approaches, the artists would only ask questions that would return the search to the core problem from a certain point on.

Is our mission being merely creative or is it being clear and explicit, too? (Artist 1)

For the artists, reduction was easier than for other participants. They used to structure ideas and interim results and were able to focus discussions and condense them to core ideas with general consensus. They clarified approaches and reduced them to the point, thereby striving to refine the message. The artists acted very process-oriented—and this process never seemed finished. They gave the joint activities momentum with striking statements that expressed their artistic work attitude. In doing so, they assumed the function of role models to others.

4.3. Interim Conclusion on Interaction with the Issue

Just do it. And later we will look at if it fits. (Artist 1)

That the behaviour patterns observed in terms of perception, reflection and action are closely linked was especially apparent with creative assignments. The artists did not have a rational approach to such tasks; even in group work, they took action without thinking twice or discussing forms of depiction. For instance, when the participants were asked to visualize the problem with collage technique, all artists literally took matters into their own hands and grabbed some material. Basically, they started with an action followed by perception and appraisal of its effects. This was a strong message to their fellow players.

For the artists, it was important to start doing something and make anything happen—everything else would stem from that. One participant mentioned clearly: “[Artist 2] was not as highbrow as we were. She used to visualize and test the possibilities immediately: How can we do this? She took material in her hands at once, while the others were still talking about how you might do it.” The artists approached the tasks consciously and yet playfully without having a plan or a result in mind: “At first glance, it seemed as if [artist 3] had a plan. But she creates something and considers afterwards what it might be”.

The artists differed from other participants in not being afraid to make mistakes. Apparently, they did not fear failure, as failure did not have a negative connotation to them. If something did not work out creatively, they patiently checked out other approaches and dealt with barren ideas in a similar way. With many tasks, they had more endurance than other players—all the more even during periods of stagnation.

4.4. Findings on Interaction with Fellow Players

Category 4. Interaction with Fellow Players/Perception

Category 4 captures impressions that indicate how the artists perceived personal sensitivities and the joint process.

How do you see this? (Artist 2)

The artists did not only demonstrate their distinct power of observation in dealing with the issue but in dealing with others as well. Participants characterized each of them as empathic. The artists had an open ear for everyone and were able to read between the lines both on a content-related and a personal level. They perceived in which mental state the others in the group were in and reacted to moods that threatened to affect the process, such as overall exhaustion. Artist 2 in particular was attentive when somebody had not participated in the joint work for some time and inquired as to the reason.

Category 5. Interaction with Fellow Players/Reflection

The fifth category displays in how far the artists reflected on their interplay with others and on cooperation behaviour within the group.

This is not about what I want but about exploiting the possibilities. (Artist 2)

The artists are characterized by the ability to accept offers without prejudice and discrimination towards others. Unless they temporarily withdrew from the joint process, they got involved with their fellow players. It was obvious that they were aware of the prerequisites for successful collaboration including their personal responsibility, because in contrast to other participants they shaped the interchange consciously. In favour of the issue, they forwent dominating the process. However, they subtly took on leadership (see Category 6).

Every idea counts. (Artist 3)

One element of Art Hacking is having the players define guidelines for good collaboration at stage 1 (attunement). With this task, some artists moderated the discussion actively. In general, the artists gave precedence to the idea over its initiator, thus fostering collaboration at eye level.

Those positive attitudes were in part thwarted by ignorance towards the effects of wayward behaviour. At times, two artists did not meet the expectations and backed out of tasks they did not like. One was aware of her rebellion, while the other was indifferent.

Category 6. Interaction with Fellow Players/Action

Category 6 is about how the artists acted and communicated with their fellow players.

Other participants described the artists as cautious actors who did not claim a special status for themselves. However, their strong presence and constructive behaviour made them secret leaders. With suitable tasks (object design, role play, etc.), they demonstrated their craft without taking centre stage, dispensing advice that was always supportive and reinforced their leading role. Aside from that, each of the four artists took the lead in their group's work process in a sensitive way. They were always careful with their groups. The others perceived them as of equal rank while simultaneously being in a subtle leadership role.

Now, just be creative! (Artist 1)

The artists motivated and challenged the others, not imposing their own ideas but stating them as offers, thereby scarcely noticeably pushing their decisions through. Oftentimes, those were

first impulses and definitions that would promote the process. However, their target orientation considerably varied—time management was only an issue for artist 3. The artists began new stages in the work process, gently determined the direction and set impulses that allowed a change of perspective: “Without [artist 3] the group would have been spinning in a circle, because no one took the lead”.

“[Artist 1] was leading and guiding us through the creative process thus steering idea generation.” The artists took over moderating every now and then, structured ideas in support of their group or interfered at critical stages. However, they did not go it alone but fed back their suggestions and took the others along. Lastly, they pushed the process forward by asking questions like “What exactly do you want?” or “How would you like to express that?”

If the group was insecure—like with questioning bystanders at stage 5 of Art Hacking (showing)—even those artists who used to be cautious observers in other situations offensively went into a leading role. By springing into action, they absorbed the others’ hesitance. The same applies to situations in which the work process stagnated: In periods of crisis the artists took the initiative and drove the process forward with persistence: “When all of us sagged, [artist 1] rearranged our ideas so that there was some new input.” The artists took care that the groups did not lose their focus. They fetched the others back to the real issue when they were lost in discussion or drifting away from the current task. “When the group was stuck, [artist 4] tried to bring us back to the problem by asking questions”.

4.5. Interim Conclusion on Interaction with Fellow Players

The artists helped the other players to see possibilities that were not obvious and used several strategies to achieve a change of perspective and to get the groups going. They reversed ideas, incited to dreaming and “thinking big” or broke out, physically taking their fellow players to other places. During stage 4 of Art Hacking (composition), it was especially apparent that they conveyed their creative power to the groups. When the objects that were meant to symbolize the concept were built, all four artists were very active. After a short discussion about different ideas and methods, they instructed the others while quickly making clear choices.

As empathic process leaders, the artists took the role of *primus inter pares*. By taking care of their fellow players, they held their groups together. In doing so, they undermined a common prejudice: “Their cautious attitude surprised me. For some reason, I had the notion that artists are extrovert personalities who love to be in the limelight. In general, all four were always there for the collective and open to every proposal.”

5. Discussion

Beyond Art Hacking, there is little evidence regarding how artists conduct themselves in arts-based interventions that are about developing approaches for intra-organizational problems and setting an impulse for change. In two cases—in which artists designed and executed the intervention backed by a process leader responsible for the whole arrangement—the artists unfolded three main areas of competence in guiding the process: “technical competence, . . . competence to build trust [and,] . . . an open process orientation” [27] (p. 45).

With Art Hacking, there were similar observations. While the artists applied basic craft techniques rather sparingly, they benefited from their special ability in passing through an open-ended, unbiased creative process. They succeeded in contributing to a relaxed situation and had the groups collaborate harmoniously. Whereas their technical advice was less important, their model function became a decisive factor in course of the process. They encouraged the other participants to engage themselves in unfamiliar working methods by demonstrating their artistic attitude, which goes way beyond being able to move in uncertain terrain.

During Art Hacking, the artists followed a course of action that is similar to the one that literature describes as genuinely artistic [28,38,39,48,64,65]. Essentially, the participating artists conducted

themselves as if they were working on a piece of art by themselves. As far as generalizable basic attitudes to perception, reflection and action are concerned, they dealt with the assignment in a similar way. They adapted themselves to the situation without assuming the working styles of other participants. In the dimension of interaction with the issue, the artists remained absolutely authentic, thereby supporting the assumption they would use artistic attitudes in the intervention.

The artists met every problem with a positive approach. They did not hang on to any rules in order to obtain assurance but enjoyed facing the uncertain with intense susceptibility and in a proactive way [28,38,39]. Similar to improvisation the artists instantly took up ideas and developed them further. They switched constantly between exploring suggestions and reflection on how they would fit into a concept [48]. Decisions were not balanced rationally but made perceptively, situational and stepwise without having a certain goal in mind [39]. The artists stayed focused on the issue, recognized incoherence and guided the process accordingly. Artists think in a medium, not imposing an idea on the process but finding it by dealing with the material [64] in “a steady change between action and reaction, perception and action, question and answer” [28] (p. 22, translation from German by the author).

The artists had a manifest strength in divergent thinking including fluency, flexibility, originality and elaboration [45]. Although the extent of their individual creativity was not tested using methods such as the Torrance Tests of Creative Thinking [66], indications of pertinent mental abilities could be observed. The artists came up with a variety of unorthodox thoughts, promoted a change of perspective and organized the details of emerging ideas more often than other participants did. Beyond divergent thinking there were some other indications for creative thinking. These were the artists’ sensitivity to the issue as well as their ability to redefine the problem and to look beyond a single functional solution [45]. Research on factors that facilitate visual artists’ creativity confirms that insight (selective combination and comparison) as well as divergent thinking are important aspects [65].

Considering creativity not as an expression of personal characteristics but as a process, there are distinctions to be drawn between artistic ways of problem-solving and designerly ways of thinking. The latter are the paragon for Design Thinking, which conveys procedural elements from industrial design such as observation and understanding, draft and refinement to idea generation [67]. In design, the concept determines the action, meaning that the idea is imposed on the process. Designers tend to act solution-oriented without necessarily exploring the whole range of possible approaches. In search for the simplest explanation for a problem, they eliminate obvious options step by step. As prototyping is a way to implement and test preconceived ideas, abstract requirements are translated into concrete objects [68,69]. In terms of logic of cognition, designerly thinking means abductive reasoning without calling the premise into question [70]. Generally, the initial objective is not contested.

In contrast, the artists who were working in the Art Hacking framework applied behaviour patterns that are rooted in artistic labour. Playing with ideas and materials comes before rational judgement and integration into the bigger picture. For an artist, the objects created are media for deeply exploring the issue and developing even seemingly unreasonable solutions. This process seems to evade any logic and allows for expanding the solution space by asking radically different questions [65,71].

In general, artists score high on cognitive characteristics like self-criticism, openness to new experiences and risk-taking [65]. In the fifth stage of the Art Hacking process (showing), the artists were more present than their fellow players. They were comparatively open to critique and took it as a starting point for further development. Along with their willingness to experiment and to accept potential failure this recognition indicates, that the artists’ self-conception is flexible in the sense of Dweck’s goal orientation theory [72], which has proven useful for explaining the mechanisms of radical innovation.

Artists are said to be motivated by two drivers: either the wish to expose personal expression to an audience or an urge for learning in the course of creation: “artists who long to be seen and heard and artists who long to listen and understand” [73] (p. 70). Although this distinct categorization must

be doubted—a continuum seems more appropriate—, there is a promising link to Alexander and van Knippenberg’s model of successful team innovation. Among other factors, radical innovation success depends on the team’s willingness to prove their performance and on their learning ability. A performance prove orientation designates the desire to demonstrate competence and to receive public recognition, whereas a learning orientation comes to the fore through experimentation and fault tolerance. It is presumed that teams that share these goal orientations will conceive highly innovative ideas [74]. Regarding Art Hacking or other arts-based interventions, the question is if and to what extent the artists succeeded in conveying their mindset to the other participants. This would be a promising area for psychological research.

Whereas the findings on “artistic idea generation” match descriptions of artistic labour, the group dynamics that unfolded during Art Hacking yielded some unexpected results: Every one of the four artists took leadership in their group, although there was no assignment to do so at all. In addition, none of the artists is a leader in their profession—none of them is a director, a choreographer or a conductor. It is no surprise that the two performance artists demonstrated a strong sense of co-creation but the visual artists did just the same although they are not used to working in a group.

While the author moderated the course of the whole workshop thus setting the frame, the artists guided the groups through idea generation. Although participants from different divisions and management levels met and despite of presumed differences in the social status between professionals and students, all groups explicitly went for a collaboration at eye level. In fact, the work process was obviously free from any hierarchy. However, the artists took the lead without enjoying a special status. If this coequal collaboration is to be attributed to targeted team building efforts as part of Art Hacking or if it is due to the artists’ social skills must remain unanswered at this point.

However, the artists’ leading role certainly goes beyond an emotional approach to dealing with uncertainty [27]. Like every other participant, the artists did not know the format in advance. Nevertheless, they were able to deal with the open situation and the creative assignments effortlessly because of their professional experience. They demonstrated aesthetic skills, took the initiative with fluency, encouraged lateral thinking by coming up with original ideas and led the process while stimulating a change of perspective by profound questions. With their ability to structure and reduce the abundant material, they pushed the process towards a convincing solution without having a clearly defined mission. When the groups transferred their concepts into objects, the artists instructed their fellow players. Last but not least, their perseverance in crisis situations pulled the others along. Usually it was the artists who set impulses that allowed for progress.

In a process that was decisively dependent on creativity, their professional attitudes and artistic strategies elevated them to leadership simply because of their expertise. Their good instinct for the dynamics of the process turned them into moderators, pacesetters, facilitators and solicitors for artistic attitudes that the non-artistic workshop leader alone would very probably not have been able to similarly convey.

In Amabile’s componential model, individual and group-level creativity respectively depends on three major conditions: domain knowledge, creative skills and intrinsic task motivation [75]. If at all, the artists’ intrinsic task motivation was potentially lower compared to other participants, because they were not faced with the initial problem in their professional life. Other than representatives and stakeholders of the organization that presented the problem, none but one of the artists had a direct personal connection to the issue let alone specific knowledge of the field. The artists had to rely on information they received from the participating experts.

This suggests that the artists’ informal leading role was primarily based on creative skills they unfolded in the process, namely personal characteristics such as a tolerance for risk, ambiguity and errors as well as cognitive strengths conducive to novel thinking [75]. In turn, this leads to the proposition that in collective idea generation artists overcompensate knowledge gaps by their extraordinary creative skills. From the experts’ point of view, professional domain knowledge seems

to be leveraged by artistic abilities and made fruitful for innovative solutions. This effect is a strong indication that artistic abilities can be effectively applied to demands for innovation.

The concept of Art Hacking is based on a premise shared by other proponents of arts-based interventions: artistic ways of working can be transferred to non-artistic settings [8,15,76]. Some studies suggest that it is possible to achieve convincing results for business problems via mere “artistic experimentation” [8] (p. 1516)—that is, by imitating creative techniques without having an artist around. According to subjective impressions of participants in one similar case, they were stepping out of their comfort zones while an innovation-friendly climate developed [18]. Another case shows that organizations can successfully apply artistic practices in their own studio spaces without any personal artistic guidance at all [77]. This is somewhat contrary to the multi-layered leadership position the artists took in Art Hacking. However, the settings are not directly comparable and there is no data on a run of Art Hacking without participating artists yet.

The fact that the artists took the lead in the process refers to research on collective creativity that suggests that leaders are less directive than integrative through dialogue and interaction [78]. Creative leadership is described as “leading others toward the attainment of a creative outcome” [79] (p. 393). In Art Hacking the artists are not just mere facilitators, who foster the creative potential of their followers, or directors, who have others carry out their ideas. Their behaviour falls into a third conceptualization of creative leadership as a combination of facilitation and direction that stresses the creative process as a collaborative effort. This third strand highlights the creative leader as a person who integrates ideas by others with their own [79].

Furthermore, the artists’ unexpected leadership qualities can be linked to the concept of “Leadership as Art” [80], which pleads for an integration of artistic skills and attitudes into management. Accordingly, leadership should have an aesthetic dimension that comprises not only cognition and analytical knowledge but implicit knowledge, physical presence and expression through interaction as well. Artful leadership is based on expanded awareness and approves reflection dedicated to the endurance of ambiguity and contradiction [80].

Regarding findings from psychological research on personality, the artists’ behaviour during Art Hacking is plausible at least as far as interaction with the issue—or even their willingness to participate—is concerned. Compared to scientists, who explore reality likewise, artists are more open, sensitive, non-conformist and original. Artists are seeking change and are open to experience [81]. It stands to reason to involve them in idea generation, because of their very nature. “By being receptive to different perspectives, ideas, people and situations, open people are able to have at their disposal a wide range of thoughts, feelings and problem-solving strategies, the combination of which may lead to novel and useful solutions or ideas” [81] (p. 300).

On the other hand, artists are demonstrably known for strong asocial tendencies such as introversion and hostility [81]. Although one artist who participated in Art Hacking was prone to evade interaction, the overall experience seems to contradict this notion. Openness and flexibility might explain the cooperativeness the artists exploited.

6. Conclusions

Artists have distinguished art-making from their “way of organizing and acquiring knowledge” [82] (27 s) by naming the latter Art Thinking [82], whereas business people start using the term for a transfer of insights from the art into the business world. Inspired by the extensive discourse on Design Thinking [83] the term Art Thinking is used to describe “a framework and set of habits to protect space for inquiry” [84] (p. 12). In this sense, Art Thinking is just an arts-based view on management tools favouring divergent over coherent thinking [84]. Art Thinking has not been conceptualized yet but it is characterized by “its focus on options, not outcomes; on possibilities, not certainty” [85] (p. 16).

In contrast to this quite general view, Art Hacking is a specific creative method and problem-solving-activity based on the course of the artistic process, on artistic attitudes and strategies.

Its lack of straightforwardness combined with a sensuous and playful approach makes it suitable for addressing determinate organizational problems. The key for a change of perspective is asking different questions, persistently scrutinizing the sense that is attributed to key variables and exploring absurd ideas. Art Hacking does not guarantee a particular result but it creates a framework that makes innovative approaches more likely to emerge. However, the present study did not aim at assessing the innovation process and putting the method to a comparative suitability test. The intention was to shed light on the role artists take in non-artistic co-creation with other professional groups.

Although data on this matter was not systematically collated, it is noteworthy that igniting sparks usually did not occur when the players were working on an assignment but while talking casually during breaks. Often it was not the flashy points that were decisive but secondary aspects and casual remarks. It was obviously helpful to have people around whose professional characteristics encompass a strong awareness and the ability to turn tiny starting points into a comprehensive body of work.

One central finding of the study at hand that was not stated in the literature as clearly and extensively before is the fact that the artists dealt with the business problem quite similarly to the creation of an artwork. They demonstrated that artistic working styles can successfully be applied to non-artistic tasks in particular with regard to those aiming at radical innovation. As highly creative persons, the artists unfolded creative skills and used artistic strategies despite the fact that they were not treading on familiar ground. They proved above-average innovative strength and pushed the process by offering different angles and stimuli towards action. This is what made the artists strong supporters of the first step towards innovation established with Art Hacking, namely idea generation.

Another insight other studies have not touched on at all yet is the artists' leading role in the process. In other depicted cases, artists had developed the concept of the intervention and moderated the process. With Art Hacking, they had a different assignment. Surprisingly, the artists took the lead anyway, cautiously and persistently guiding their fellow players through the process by being role models in creative behaviour without reclaiming a special status within the group, acting out an integrative form of creative leadership instead.

As there are different leadership styles in the performance arts as well as in management, it would be interesting to explore that aspect both in the context of Art Hacking and regarding arts-based interventions in general. Are arts-based interventions more likely to succeed if there is a director or some other experienced creative leader involved? What are the effects of different creative leadership styles in innovative settings? And finally, is it necessary to have someone from the creative industries to enact creative leadership or can other people do likewise?

Other cases show that organizations can successfully apply artistic practices without any personal artistic guidance at all [18,77]. This possible contradiction to the findings presented here might be due to the limited generability of qualitative research and single case studies, respectively. Therefore, there is need for comparative research on the effectiveness of artistic conduct. Moreover, the different approaches to implement artistic attitudes and labour strategies in business settings deserve further research on success factors for applied artistic practice. At present, there is no research that opposes processes with artistic participation to interventions in control groups with respect to their innovative capacity.

However, there is evidence for the assumption that the active participation of artists during a collective innovation process is an effective catalyst. In any case, the leadership role the artists took in Art Hacking deserves a closer look, given that it would help debunk the outdated romantic myth of the artist as a lone genius with outsider status.

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Article

From Design Thinking to Art Thinking with an Open Innovation Perspective—A Case Study of How Art Thinking Rescued a Cultural Institution in Dublin

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Abstract: This article uses a contemporary and revelatory case study to explore the relationship between three conversations in the innovation literature: Design Thinking, creativity in strategy, and the emerging area of Art Thinking. Businesses are increasingly operating in a VUCA environment where they need to design better experiences for their customers and better outcomes for their firm and the Arts are no exception. Innovation, or more correctly, growth through innovation, is a top priority for business and although there is no single, unifying blueprint for success at innovation, Design Thinking is the process that is receiving most attention and getting most traction. We review the literature on Design Thinking, showing how it teaches businesses to think with the creativity and intuition of a designer to show a deep understanding of, and have empathy with, the user. However, Design Thinking has limitations. By placing the consumer at the very heart of the innovation process, Design Thinking can often lead to more incremental, rather than radical, ideas. Now there is a new perspective emerging, Art Thinking, in which the objective is not to design a journey from the current scenario, A, to an improved position, A+. Art Thinking requires the creation of an optimal position B, and spends more time in the open-ended problem space, staking out possibilities and looking for uncontested space. This paper offers a single case study of a national arts organisation in Dublin facing an existential crisis, which used an Art Thinking approach successfully to give a much-needed shot in the arm to its commercial innovation activities.

Keywords: Art Thinking; Design Thinking; creativity; innovation; strategy

1. Introduction

Recent literature suggests that if enduring and sustained attention for a topic is an indication of its value, then Design Thinking merits considerable further scrutiny [1]. The motivation for this paper is to add to the recent scholarship on Design Thinking, but also to contribute to the foundation of an emerging dimension of Design Thinking: Art Thinking [2]. Promoters and critics differ in their assessment of the value of the process [3] of Design Thinking and its user-centricity [4–6], which can tend to anchor solutions in more prosaic and incremental territory. Art Thinking, by contrast, has the capacity to liberate its practitioners from the user experience that characterises Design Thinking and can thus offer more creative, radical and disruptive options [2].

In Dublin, we examine a case of the oldest, largest and most prestigious fine art gallery and studio, where most of the country's best-known and successful visual artists make, exhibit and sell their art. Graphic Studio Dublin is primarily a printmaking studio, established by artists 60 years ago. It has facilities for woodblock, lino-print, silkscreen, intaglio and carborundum etching spread over four floors of a centrally located studio where the artists have access 24/7. However, two years ago, it found itself on the brink of bankruptcy, having borrowed heavily to invest in new facilities

during the period of Ireland's economic collapse. Its loans were sold to a vulture-fund who were about to foreclose in a move that would have seen a generation of Irish artists displaced. This was compounded by the collapse of GSD's twin engines of revenue: state funding and consumer demand for fine art. A new board of directors was empanelled, and they introduced Art Thinking principles to rescue the organisation from the brink of bankruptcy. They used an Art Thinking mindset and Design Thinking tools to restore the fortunes of this venerable, artist-led institution and Graphic Studio Dublin was saved.

This paper is structured as follows: it opens with a description of the turbulent commercial operating environment that exists for most organisations and can be particularly acute for arts organisations. These complex conditions require a managerial finesse, a blend of creative and scientific thinking, which is present in Design Thinking. Hence, a literature review of Design Thinking follows. Towards the end of the literature review, we discuss an emerging concept, Art Thinking, which offers a more deliberate creative approach. There is a brief rationale included for the selection of a case study and, in particular, an outlier one. In the following section, we introduce a revelatory case study of a national arts organisation in Ireland whose finances were dangerously overstretched during the recession, leading it to the brink of collapse. We describe how a combination of Art Thinking and Design Thinking managed to rescue the organisation from the brink. There follows a section on conclusions and recommendations.

2. Literature Review

This section will provide an overview of the literature on Design Thinking, within which its history, its overarching principles and various tools will be identified. It will conclude with a review of the slender volume of scholarly output on the concept of Art Thinking.

Volatility, Uncertainty, Complexity and Ambiguity, the acronym VUCA, was coined originally to by the US military during the Gulf War to describe the conditions of the frontline [7]. Latterly, this is the description given to the cut and thrust of the digital revolution [8]. The turbulence it describes is increasingly being seen by business leaders as the 'new normal'. Volatility indicates chaos where reliable prediction is impossible and where change is regular and substantial [8]. Uncertainty refers to the difficulty in interpreting coherent patterns in the change (Ibid). In uncertain environments, the connections between cause and effect are understood, but the scale and timing of the changes are not. By complexity is meant the complex ecosystem of moving parts in any market. It describes iterations of simple patterns [9] combined in a labyrinth of overlaps and loops making it difficult to decipher the signal from the noise [8]. Finally, ambiguity refers to our lack of capacity to read the signals from markets or consumers with any clarity, certainty or accuracy. In a recent editorial about design, *Time Magazine*, underlining the growth in importance of design, reported:

'In this new era, smart corporate leaders are embracing the idea that design can be a crucial differentiator. Only a decade ago, senior business executives tended to dismiss design as a second-tier function—a matter of aesthetics or corporate image best left to the folks in marketing or public relations. Today design is widely acknowledged as a C-suite concern and a key element of corporate strategy.' [10]

Fortune Magazine [11] reports that smart business leaders are embracing the idea that design—channelling insight to delight and truly connect with customers and users can be a crucial differentiator. Kimbell [12] notes that the term 'Design Thinking' has come to the fore among educators, academics, managers and the design community as a way to distinguish between the technical, craft skills of actual designers, and a way of approaching business or management problems that reproduces, in a simplified way, the approach a designer might take. Businesses look at it as a way to balance the natural tension between 'explore and exploit' [13], or as a plug-and-play creative process to kick-start innovation [14].

Evidence of the arrival of Design Thinking as the preferred approach for business to successfully facilitate innovation is not hard to find. Design thinking is especially suited to VUCA conditions [7] because it enhances organisational learning, improves organisational absorptive capacity and it approaches these complex and ambiguous problems from the perspective of the customer. On retail bookshelves, popular management books on Design Thinking, compete for space [14–17]. Prominent articles have also been appearing in top academic management journals, such as the *Academy of Management Journal* (2015) and the *Journal of Product Innovation Management* (2015, 2018), as well as in management journals like the *Economist* and the *Harvard Business Review*, *Business Week*, *The Wall Street Journal* and the *New York Times* [18]. However, the overwhelming evidence of its success comes from all the companies who have adopted it. As Kolko [19] puts it, there is a shift underway, one that puts design much closer to centre of the enterprise. Curedale [17] lists a selection of these organisations which, inter alia, include: SAP, GE, Target, Pepsi, Whirlpool, Bayer, Mayo Clinic, DHL, P&G, Philips, Airbnb, GSK, Nike, Airbus, Panasonic, Shell, Cisco, Unilever, JetBlue, Black & Decker, IDEO, Intuit, Mattel, Bank of America and Microsoft.

Design Thinking has gained traction not just with the corporate sector but also with government bodies. Kimbell [12] notes that:

‘In the UK, for example, the government-funded national Design Council, argues that Design Thinking plays a key role in innovation (Design Council 2009). In Denmark, a cross-ministerial innovation unit called MindLab combines design-centred thinking and social science approaches to create new solutions for society.’

Ireland is also becoming a hotbed of Design Thinking as a consequence of hosting local operating units and sometimes R&D centres for many of these companies. However, in case there could be any doubt of the all-pervasive nature of Design Thinking, this was dispelled when Bank of Ireland, the country’s oldest (230 years old) and, arguably, most conservative bank, hired a head of Design Thinking in 2015. Equally, when the practice of *project management*, traditionally focused exclusively on the ‘solution space’ declares they need to embrace Design Thinking’s approach, its capacity and tools to clarify and elaborate on the ‘problem space’, you can tell things are changing [20].

Professional services have also joined the party with Accenture snapping up Fjord, a global design agency, in 2013. PriceWaterhouseCoopers (PwC) acquired BGT, a digital creative consultancy while Ernst & Young (EY) bought a design agency called Seren. In Ireland, Deloitte acquired Red Planet, and internationally, they bought Doblin and Monitor, both design-driven, innovation agencies. McKinsey bought Lunar, a design agency based in Silicon Valley, in 2015.

3. Discussion with Case Study

Liedtka [18] acknowledges that while a generally accepted definition of Design Thinking has yet to emerge, all definitions share one or more common elements (see Box 1). Nigel Cross [21], one of the key authors on the topic deliberately sets a very broad definition:

‘We all design when we plan for something new to happen, whether that might be a new version of a recipe, a new arrangement of the living room furniture . . . The evidence from different cultures around the world, and from designs created by children as well as by adults, suggests that everyone is capable of designing. Therefore, Design Thinking is something inherent within human cognition: it is a key part of what makes us human’.

Lockwood [22], a former President of the Design Management Institute, suggests Design Thinking is:

‘a human-centred innovation process that emphasises observation, collaboration, fast learning, visualisation of ideas, rapid concept prototyping and concurrent business analysis.’

Mootee’s [16] definition focuses more on the process and defines Design Thinking as:

‘the search for a magical balance between business and art, structure and chaos, intuition and logic, concept and execution, playfulness and formality and control and empowerment.’

Mintrom and Lieutjens [23], whose emphasis is on the policy arena, assert:

‘Design thinkers exhibit curiosity and empathy in their efforts to interpret how target populations engage with their world. They deploy various investigative techniques that have the potential to illuminate problems in new ways and indicate effective client focused solutions.’

Like marketing, Design Thinking foregrounds the wants and needs of consumers, but Curedale [17] notes that Design Thinking has moved past and is superior to marketing. Far from being merely a tool of the marketing armoury, where it helped, through advertising and packaging, to make people want things, it is now about designing things people actually want. What connects the definitions is that Design Thinking is invariably user-centred and founded, ideally, on some actionable insight. It is highly visual and relies on customer observation, developing thick, rich ethnographic portraits of customer behaviour and trying to identify themes and patterns (unmet or under-served needs) from the observations.

But unlike Marketing, Design Thinking assumes that the problem is ill-defined and focuses on precision, insight and accuracy in defining the real problem. Box 1 below includes a summary of the elements typically comprised in a design thinking approach. Specifically, the inclusion of customer, consumer or ‘end-user’ perspectives in finessing the problem facilitates a better comprehension of the issue and when this superior understanding is coupled with creativity then it is more likely that the solution will be based on higher ground rather than common ground [24].

Design Thinking classifies consumers into discrete segments and develops individualised personas for each segment, these are usually developed after an intensive period of observation, watching what people do and listening to what they say [25]. The next step is to use brainstorming techniques to generate novel, original and radical ideas for each segment. The generation of ideas is an interdisciplinary group exercise; it brings in multiple viewpoints and multiple stakeholders and challenges assumptions. Then ideas are prototyped as either simple, written or illustrated concept-boards or as more refined artefacts. Then field experiments are designed to measure the appeal of the ideas and to discover whether they might find traction with the target market [26].

Box 1. Conventional elements of a Design Thinking process or approach.

<p>Problem Definition—one that accurately describes the problem the initiative is trying to resolve or, alternatively, the opportunity it is attempting to exploit.</p> <p>Insights and Empathy—an ability to ‘walk in the users’ shoes’ and to understand their pains and gains is vital to being able to develop ideas likely to resonate with them. When the process uncovers genuine insights about what people do, why they do it, and how their experience can be improved, this can lead to better design criteria, and ultimately to great work.</p> <p>Iterative Approach with a bias towards experiment and action—unlike traditional quantitative market research, where a little information is gathered about a lot of people, Design Thinking thrives on the opposite. It builds an intimate and vivid portrait of just a few people and tries ideas out with them. Designers do not follow a direct route from problem to solution, but instead move to and fro between problem(s) and solution(s). For instance, Cross indicates that ‘designing does not proceed in a sequence of stages that targets each one of the (partial) problems initially identified or outlined. Instead, designing appears to proceed through an iterative form of interplay between partial problems and their solutions’.</p> <p>Abductive Reasoning—Dunne and Martin [27] refer to this as the logic of what might be whereas deductive and inductive are the logic of what should be or what is. Abduction is more than just ‘backing a hunch’. It is an approach in conventional problem solving when, according to [28] ‘we know both the value we wish to create, and the ‘how’, a ‘working principle’ that will help achieve the value we aim for. What is missing is a ‘what’ (an object, a service, a system), that will give definition to both the problem and the potential solution space within which an answer can be sought.’ Abductive reasoning is a key part of Design Thinking [29,30].</p>
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This process is most often found using a visual observation example, in which a person makes hypotheses or tries to explain some behaviour they've seen. It is very often also associated with the 'flash of insight' or the 'eureka moment' in a discovery [30]. But Design Thinking does not rely solely on abductive reasoning, it blends 'a cyclic combination of abductive, deductive, and inductive reasoning processes' (p. 42) [31]. Theory of 'designerly ways of knowing' emerged in the 1970s when the missing 'third area' of education was described as the piece that, depending on your perspective, either links or divides the sciences and the humanities—design thinking or thinking in 'designerly' ways [32].

An Ethnographic approach—deep, rich, vivid observations are deemed more likely to reveal actionable insights; hence, Design Thinking favours close observation, often in the form of actual participant diaries, video diaries, vlogs, photos, recordings where the emphasis is on capturing the customer behaviour at the key moments of truth in a customer experience.

Brainstorming and Ideation—finesse mild and wild ideas about potential opportunities. These tools encourage creative behaviours such as withholding judgment, avoiding debates and seeking higher-order thinking by building on the ideas of others and leveraging the diversity of the team. Cross [21] noted that science investigates existing forms but design initiates new forms, and it does this through brainstorming and other creative techniques.

Prototyping Techniques—these facilitate, making abstract ideas tangible and easy to understand and comment on by participants. Techniques include storyboarding, concept or mood boards, user scenarios, metaphor, experience journey maps and simple graphic illustrations [15].

Co Creation—incorporates tools and methods that allow consumers or users engage in the design of future product, service or experience ideas.

Learning Launch, Pilot and Field Experiments—are designed explicitly to test underlying assumptions in the field. Ideally, these are done in controlled environments, and latterly, crowdfunding sites like Kickstarter and Indiegogo have been very helpful in gauging likely future interest in proposed new ideas.

Liedtka [18] observes that none of these elements are new; individually, they can all be found elsewhere in management theory and practice. Similarly, Mulgan [33] observed that Design Thinking is 'a synthesis of methods drawn from many fields that, when sewn together helpfully mitigate the traditional limitations of their individual origins'. They conclude that when the elements are combined in an end-to-end process or programme (see Figure 1), Design Thinking emerges as a distinctive and valuable system of practice. Design Thinkers have to take what Dorst [34] calls a 'double creative step' by both designing new ideas or solutions and also testing and modifying them in parallel. This parallel creation defines design thinkers as very separate from traditional managers who rely, predominantly, on logical reasoning, data and analysis.

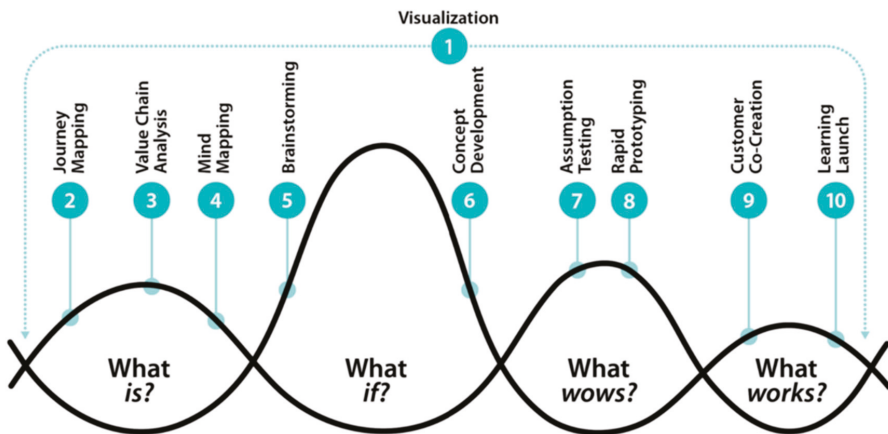


Figure 1. The Darden model of Design Thinking—an end to end sequence of tools [15].

Academics and practitioners alike now coalesce around broad definitions of Design Thinking that see it as a creative, iterative, hypothesis-driven process that is focused on both the problem and the solution. Relying on abduction and experimentation, it balances the twin drivers of possibility and

constraint and works best in situations of high complexity, ambiguity and uncertainty (in other words, VUCA environments). It has to navigate between customer wants and needs, client expectations, social circumstances, business models, opportunities in technology and contemporary aesthetic canons.

While some designers try to make their steps explicit, Cross [21] observes that others are deliberately, even wilfully, obscure when it comes to revealing the processes they use to arrive at great designs. Philippe Starck suggested that his was a ‘magical’ process of epiphany and, similarly, Alessi said ideas came to him in a ‘vision’. However, a recurring theme in design research is the role of intuition [35], and it is the quality of this intuition that probably separates the best designers from the rest. An additional characteristic commonly possessed by designers is a capacity to dwell in a problem space where there can be an uncomfortable degree of ambiguity and apparently conflicting demands. Design Thinking, on the other hand, has evolved to eliminate, or certainly reduce, both intuition and ambiguity by providing a series of simple, stepwise templates that give users the comforting illusion of control over the process. In design, the quest is first for options, rather than solutions, and this is not always the case with Design Thinking.

3.1. The Way Designers Think

Davies and Talbot [36], in a series of interviews with designers, trying to understand what made them more creative than other professions, discovered that they rely heavily on *intuition* for their ideas. One of the interviewees, Jack Howe, an architect and designer, said ‘I believe in intuition. I think that is the difference between a designer and an engineer’ [37]. Today, a similar observation can be made about the difference between data-scientists and design thinkers. The latter use abductive thinking or intuition while the former rely exclusively on data. Cross [21] suggests that the term intuition is really a convenient shorthand for what really happens in Design Thinking which—as opposed to inductive or deductive thinking—is abductive thinking. Deductive reasoning is the reasoning of formal logic. It begins with a hypothesis, perhaps one such as: all swans are white. Then, some fieldwork is designed to either prove or falsify that hypothesis. This is the dominant orthodoxy for business analysis. This is the bread and butter of all MBA-trained executives. Inductive reasoning, however, aims to build theory from data. Hence, it does not begin with any firm hypothesis; it begins by observing how things actually are and then it builds theory accordingly. This is generally used in more qualitative contexts, where the variable being studied is highly context-dependent, like corporate innovation—how firms come up with winning ideas, for instance. Abductive reasoning is a blend of the two types that employs intuition to stimulate divergent thinking and, ultimately to arrive at more original ideas (see Box 1).

Quantitative, big data analytics are now synonymous with the digital business environment, but prevalent use of data mining methods rely exclusively on observations about past behaviour and are not necessarily a reliable guide to the future [7]. To thrive in the VUCA environment, businesses are increasingly turning to more sophisticated and sensitive frameworks and structures to allow them sense attractive market opportunities and seize them as they move more sharply into view [38].

Cross [21] offers a fascinating vignette in an attempt to deconstruct designers do. The case he describes is Philippe Starck’s iconic design for a lemon squeezer. In the late 1980s, Philippe Starck was already a celebrated designer of a wide range of different products. He was approached at that time by Alessi. The Alessi company had begun to develop a new series of homeware or kitchen products designed by famous designers, including kettles and coffee pots by architects Michael Graves and Aldo Rossi and cutlery and condiment sets by industrial designers Ettore Sottsass and Roger Sapper. They invited Starck to contribute to this prestigious series of new products and they suggested that he work on designing a lemon squeezer. The story goes that Starck came to Alessi, outside Milan, to discuss the project and, following the meeting, took a short vacation on the small island of Capraia, just off the Tuscan coast.

While there, he dined in a pizza restaurant, called Il Corsaro (translated as the buccaneer or pirate). He mused over the lemon squeezer project as he waited for his food to arrive—he had ordered the

squid. He began to sketch on the placemat in the restaurant and his first iterations (in the centre to the right of Figure 2) reflected conventional squeezer designs; see Figure 2. However, as his food arrived, something else was triggered in his imagination and he began to create images of strange forms with big bodies and long legs. Ultimately, in the bottom left of the placemat, he arrived at the blueprint for what was to become one of the iconic designs of the 20th century.

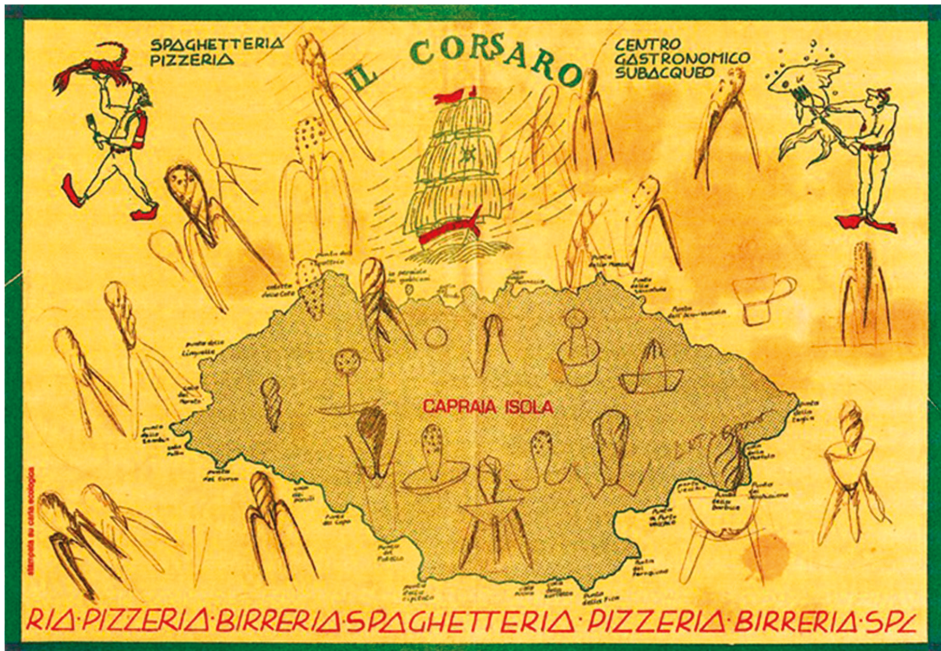


Figure 2. Starck's original design sketches for the Alessi lemon squeezer.

Lloyd and Snelders [39], in describing the probable creative trajectory for this great design, suggest that the squid-like concept was not a sudden flash of inspiration from out of the blue but that it arose from a form of analogy that probably began unconsciously but gradually became more deliberate. It is the intersection of three forms of parallel thought. The first is the problem of how to squeeze a lemon, the second involves creatively mining the possibilities offered by the shape of the squid and the third draws on Starck's interest and liking for science-fiction comic books in his youth and the unmistakable resemblance to some shapes, possibly from HG Wells' War of the Worlds.

However, as Design Thinking becomes more widespread, so its limitations become more evident. One such limitation is that inherent in Design Thinking is its user-centric approach. It places users in the centre of the process and gives them the dominant voice in the innovation dialogue. While customers are *the* necessary ingredient for any successful business, they are rarely gifted with imagination or penetrating insights about the future. They cannot anticipate unmet or unarticulated needs and they are rarely the source for radical ideas. Design Thinking tends to anchor innovators in the incremental and hence, while it is a great set of tools for businesses, it can constrain breakthrough thinking.

Another shortcoming concerns Design Thinking's core discipline being design. However, design has historically concerned itself with the design of objects, artefacts, products—physical things [40]. Famous designers are generally famous for designing in specific physical domains: Frank Gehry designed wonderful buildings; Coco Chanel designed beautiful clothes; Jonny Ive designed breathtaking phones and computers; Paul Rand designed memorable logos, while Ray and Charles Eames designed stylish furniture. Hence, as design expands its operating remit into services, into

experiences and even into strategy another problem can emerge. Brown and Martin [40] note that when designers take a brief, an issue or a business opportunity and go away to work their magic on the problem at hand, inevitably they return to the boardroom with their proposed solution and when they do, one of four things often happen. This scenario increases in likelihood with the degree of difference between the designer's proposal and the current operating model. The more the proposal deviates from the business-as-usual scenario, the more likely executives are to have this reaction: '(1) This does not address the problems I think are critical. (2) These aren't the possibilities I would have considered. (3) These aren't the things I would have studied. (4) This is not an answer that is compelling to me' (Ibid.). As a consequence, winning commitment to the strategy tends to be the exception rather than the rule, especially when the strategy represents a meaningful deviation from the status quo'. Fortunately, the toolbox of Design Thinking has an approach to manage this disconnect. Instead of making the proposed change look like a small number of big steps, they do the opposite and by iteration and low-res prototypes, they make the change seem like a logical sequence of lots of small, incremental steps.

In framing the relevance of this case study, it's worth noting that Design Thinking's association with the tourism and arts sector is already established; cases include the future of hotels [41], Indian artisanship [42], a cultural cluster in Dublin [43], and a wine region in Spain [44].

3.2. *The Beginnings of an Art Thinking Movement*

Whitaker [2] notes that Art Thinking shares several similarities with Design Thinking. They both provide a framework and tools for facilitating the design of a new product or service. An important distinction she draws is that 'whereas a framework originating in product design starts with an external brief—'What is the best way to do this?'—Art Thinking emanates from the core of the individual and asks, 'Is this even possible?'" Art Thinking spends much more time in the problem space: it is not customer-centred; it is breakthrough-oriented.

Coles [45] notes that there has always been a rift between art and design in our culture. He notes that purists on both sides are keen to maintain their disciplinary differences, while others believe that design is a suitable bedfellow for art and that art should be more 'gregarious' and reach out beyond its confines. Some see design merely as decorating art for human use and hence any such 'decoration' is undesirable. However, as early as 1859, Ruskin, showing little sympathy with this argument, insisted that:

There is no existing higher order for art that is decorative. The best sculpture yet produced has been the decoration of a temple front—the best painting, the decoration of a room. Get rid, then, at once of any idea of Decorative art being a degraded or separate kind of art.

In his series of essays, *The Shape of Things* [46], the first essay is entirely devoted to the origin of the word 'design'. It stems from the Latin word *signum* meaning 'sign'. Thus, etymologically, design means to 'de-sign'. So far from adding unnecessary decoration, it entails the removal of something: a simplification. In the same essay, Flusser went on to elaborate on other words often used in the same context—such as technology. The Greek word *techne* actually means 'art' and is a first cousin of 'tecton', a carpenter. The basic idea here is that wood is a shapeless material to which the artist, the technician, the carpenter gives some design and form.

Therefore, in derivation and etymology, the words technology, art and design are very closely related. However, what Coles [45] calls 'modern bourgeois culture of the mid-nineteenth century' has created a very sharp distinction between the world of art and that of technology. This has split the culture and practice into two mutually exclusive branches: one scientific, data-driven and 'hard' and the other intuitive, aesthetic and 'soft'. This unfortunate split became irreversible with the rise the machine bureaucracy organisation [47]. Yet, the only discipline capable of bridging these two disparate worlds and of integrating them is design. In Flusser's [46] view, design indicates the sweet spot where

art and technology meet to produce new forms of culture, and so the role of design is crucial to the vitality of the arts and similarly, the role of art is at the very heart of design.

Science and art are separate realms where one prizes data and the other aesthetics: it has long been noted that gifted practitioners of the former and very often equally talented at the latter. Metz [48] notes that Einstein played both the piano and violin: Max Planck composed songs and even a full opera. He also played the piano, organ and cello. Roald Hoffmann, the Polish-American theoretical chemist who won the 1981 Nobel Prize in Chemistry also published plays and poetry. Nobel Prize winner in 1906, Santiago Ramón y Cajal was a celebrated photographer and artist. Pomeroy's research (2012) suggests that Nobel laureates in the sciences are 17 times more likely than (the average scientist) to be a painter, 12 times more likely to write poetry, and four times more likely to be a musician. Students of Leonardo Da Vinci or Albrecht Dürer will not be surprised at this, as they were also scientists, as well as being consummate artists. The link is thus long-established.

There is another dichotomy at work here, too, and that is the division between strategy and creativity. Bilton and Cummings [49] assert that this, too, is a false dichotomy. Business leaders often equate creativity (sometimes disparagingly) with novelty, spontaneity, like an unplanned eruption of new and often random ideas. They see 'creativity as unfettered, dynamic, borderline-crazy right-brain thinking' (p. 5). While strategy, on the other hand, is rational; it is solid, it is about systems, control and accountability. On both sides, creativity and strategy are seen as extraordinary opposites of one another rather than as integral to each other. For a strategy to be successful, it has to have an element of creativity within it—otherwise it would be a predictable, paint-by-numbers plan which would not offer any competitive advantage. In addition, for creativity to take root, for an idea to spread, it too needs to be framed strategically, rationally, otherwise it would just pop, fizz and evaporate. Arthur Koestler [50] similarly concludes that invention or discovery takes place through the combination of different ideas and angles. He notes that the Latin verb '*cogito*', to think, actually means to 'shake together' which is the creative act of making connections between previously unrelated things. In the business world, this is known as 'kaleidoscope thinking': the shaking together of known elements into previously unconsidered combinations [51].

Fresh perspective to this debate was brought when business and management guru, Daniel Pink said in a New York Times interview that the 'Now the Master of Fine Arts, or MFA is the new MBA'. Pink sees that much of the work of analytics and mathematics that is central to business can now be done better and more easily by computers and it is now time, given that we now compete in a creative economy, to allow the right brain take centre stage. Pink later converted this assertion into an HBR article [52] in which he explained the reasons for the rise in demand for creative people coupled with the oversupply with people with MBAs explains why the MFA is now the 'hottest credential' in the world of business.

Amy Whitaker's [2] book entitled *Art Thinking* is the first substantial effort to flesh out the notion of Art Thinking. In it, she has some practical insights. She describes the root of the concept to be Schumpeterian, insofar as capitalism is entirely predicated on change and the need for disruption and reinvention to stimulate business growth. Schumpeter asserted that if firms keep doing the same thing, eventually they go out of business. 'Following patterns rather than inventing new ones will only get you so far.'

Progress for any organisation demands that it be able to refresh its portfolio of market offerings, allowing the old products and services give way to its new innovations. Schumpeter [53] referred to this as creative destruction, where new ideas capsize and replace the old ones. Drucker [54] supported this paradigm when he said that 'innovation depends on organised abandonment'. Art Thinking is for companies seeking this type of growth, possibly even transformational growth. 'They can grow by scaling up to the most efficient level of production. Or they can grow artistically by the alchemy of invention.' Whitaker [2] recognises that this can be challenging for business because:

'Business prizes being able to put prices on things and to know their value ahead of time. Yet, if you are inventing Point B, in any area of life—you can't know the outcome at the

moment you have to invest money, time and effort in the Point A world. This is the central paradox of business: the core assumptions of economics—efficiency, productivity and knowable value—work best when an organisation is at cruising altitude, but they will not get the plane off the ground in the first place.’ (p. 8)

While Whitaker’s emerging theory of Art Thinking has yet to be empirically tested, there is one mention of it in the literature: a 2016 conference presentation about the car brand Mazda [55] in which the authors assert that Mazda believe ‘the car is art.’ They underpin this contention, from interviews with 5 Mazda designers, by explaining that these artists try to express their emotions and beliefs in car design. They would not compromise themselves by pandering explicitly to customer needs. In doing this, they go beyond Design Thinking, which ‘tries to meet specific customer needs’, and they enter the realm of car design motivated by Art Thinking.

3.3. Case Study Rationale

Yin [56] specifies three types of case study: exploratory, descriptive and explanatory; while Stake [57] names two: intrinsic and instrumental. Yin considers case study to be better able to rationalise the causal relationships in real-life events than empirical research strategies. Case study methodology also has the capacity to vividly describe the situation under investigation, providing important contextual detail. It allows issues to naturally come to the surface, and in situations where the results or effects are indistinct, the case study methodology provides space to explore.

Art Thinking is a new and emerging concept in the innovation literature and one reason conventionally provided for using a single case study design is that the single case can represent a critical test of a significant theory [57]. It is too early in the development of Art Thinking to refer to it as a significant theory, but nevertheless, the choice of this single case study is to provide some confirmatory, should the data back it up, evidence of the promise of this new area of research. Another reason for choosing this single case is that the author has privileged access to ‘a situation previously inaccessible’ [58]. A third reason for choosing it is that there is longitudinal data available allowing analysis at different points in time.

3.4. Details of the Case Study

Strategic initiatives in the Arts include bringing in strategic frameworks or strategic management or generally importing approaches from the business world, often at the behest of senior managers, of government funders or other stakeholders like Board directors. Hence, ‘strategy’ in the arts is usually resented as something that is imposed from outside and something that needs to be tolerated temporarily till the recession or existential crisis recedes and the organisations get back on their feet.

The story of the recent history of Graphic Studio Dublin is the story of a highly creative strategy being applied to an Arts organisation with profound and positive effects; a story of how strategy rescued a national arts organisation from the brink of closure and ruin and restored its place in the visual arts ecosystem as well as restoring its fortunes. What makes it exceptional and, therefore, revelatory, is that it deals with an organisation going through a crisis. However, in order to tell the story, like all good research subjects, it needs a little context. This context requires a visit to 1960s Dublin. Ireland in the mid-twentieth century was delicately balanced between an economic isolationism imposed both by the end of the second world war and by a political leader who favoured self-sufficiency and protectionism, which turned into the twin drivers of economic stagnation for almost a decade. On the other hand, and despite the economic stasis, the arts were seeing an expansion; a cultural revival.

Several notable, even defining cultural initiatives took place in Ireland at this time in both public and private spheres: the establishment of the Wexford Opera Festival, the Dolmen Press, the Arts Council, the Dublin Theatre Festival, and the Irish Georgian Society. In terms of policy, too, there was the launch of TK Whitaker’s 1958 Economic Development Plan (which was Ireland’s blueprint out of self-imposed economic atrophy), the launch of Ireland’s first national television

broadcasting service called *Telefis Eireann*, the publication of *Design in Ireland* by the Scandinavian Design Group, and the opening of the Kilkenny Design Workshops in 1965. Ireland was also opening up to international cultural influences. During the 1960s, the Beatles performed in Dublin, as did Ella FitzGerald, The Rolling Stones, Oscar Peterson, Cliff Richard, Louis Armstrong and Bing Crosby.

One other remarkable development in Ireland occurred at this time: Shannon, the first new town founded in Ireland since the 17th century, was established in 1963 and was based not around a harbour or a fortress, nor a market (as all towns had been since Medieval times). Rather, it was located at an airport. Shannon and the other institutions mentioned were all responding to significant gaps in the cultural, educational and economic landscape in Ireland at that time.

However, while there was considerable change, the air was also heavy with continuity, certainly in the Arts. The fact that the Arts Council had been overseen for over a decade by two priests in succession, Monsignor Pdraig de Brún (1959–1960) and Father Donal O’Sullivan (1960–1973), now seems remarkable. There were nine board members of the Arts Council, and all were male, and as the leadership was coming from the most conservative pillar of Irish society, the Church, it is hard to imagine anything but the most conservative projects and initiatives getting financial support.

It was against this backdrop that in Ireland’s cultural district, often called ‘Baggotonia’—the Georgian streets around Merrion Square and Baggot Street- that Graphic Studio Dublin (GSD) was founded. It was created, by an eclectic set of founders (see Figure 3), for artists and it was led by artists. GSD was Ireland’s first fine art print studio and for its first three decades, it struggled to survive, sustained only by idealism and a grim determination to provide shared facilities so that talented artists could make important art. The chronicler of the organisation, Brian Lalor, in his book, *Ink Stained Hands* [59] makes an insightful observation about the early years:

Ink Stained Hands is the story of this triumph—over the absence of an informed critical climate and the absence of a marketplace, over infighting, personal antagonisms and feuds, over ideological differences and intransigence disguised as high principle and through a web of official misunderstanding—it emerged half a century later, invigorated with idealism and optimism intact and a lengthy inventory of artistic achievement to its credit. (p. XXIII)

The founders of the Graphic Studio were a group of five well-intentioned, hugely talented and diverse characters, each with a distinct and established profile in the arts. Their backgrounds spanned education, publishing, architecture, literary criticism and painting and printmaking. See Figure 3:

The Founders

Elizabeth Rivers	Anne Yeats	Liam Miller	Patrick Hickey	Leslie MacWeeney
1903–1964	1919–2001	1924–1987	1927–1998	1936
Born in England; studied at the Royal Academy	Daughter of WB Yeats; niece of painter Jack B Yeats	Lover of literature and theatre; Liam was an architect who worked with Michael Scott and was a typographer and publisher	Born in India and brought up in England. Returned to art college in Italy at age 30. He lectured in UCD on architecture and was, afterwards, head of painting in NCAD	Brought up in Dublin in wealthy medical and military family—with a governess. Entered NCAD at age 15, lying about her age. Prolific and gifted painter and printmaker, she now lives in Boston and has been an educator and art administrator
A founder member who taught night courses in wood engraving and woodcut. Designed the GSD logo	A competent painter but also experienced administrator	Set up Dolmen Press, an impact mainly for artists—managed the finances in GSD. The sponsor’s portfolio was developed as a gift for the 75 initial subscribers/donors	The original master printer. Produced over 400 prints over 33 years with GSD	Her involvement with GSD waned after she left to live in US in 1972

‘GSD succeeded in its artistic aims but tended to falter philosophically because of a core weakness—it depended for its continued growth on the chance mix of individuals to create a living culture. Sometimes this worked and sometimes it didn’t.’ (p70)

Figure 3. Founders of Graphic Studio Dublin 1960.

Printmaking was also enjoying a resurgence in North America, in Britain, France, Russia and Scandinavia and many new print studios were being set up, often with the assistance of generous

philanthropic donations. Hence GSD can be seen as part of a more widespread pattern on international development in fine-art printmaking. Many of the world's leading print studios were set up around this time. In the US: Pratt Contemporary Graphic Art Centre (1956), Tamarind Lithography Workshop (1960), Crown Point Press (1962) and Hollanders Workshop (1964). England saw the establishment of the Curwen Press (1958) and Scotland, Edinburgh Printmakers (1967). The seed funding of these various establishments tells its own story. In the US, big businesses were more established, and the germs of the concept destined to become corporate social responsibility were already visibly benefiting the arts. Pratt-Contemporaries received a donation of \$50,000 from the Rockefeller family, while Tamarind received \$135,000 from the Ford Motor Corporation. Figure 4 shows some of the printmaking techniques used in GSD.



Figure 4. A flavour of the work that takes place in the Graphic Studio Dublin.

However, raising money, especially for the Arts, in the cash-strapped Ireland of the 1960s, was a far trickier proposition. The Irish Export Board came forward with £120 and, while this was derisory when compared to US funding, in Ireland's low-wage and even lower-expectation economy, it was able to go a long way. However, one of the early successes of GSD was an imaginative business model they developed through which generous individual sponsors were encouraged to make a modest annual contribution in return for which they would receive as a gift a small portfolio of prints. This 'sponsors' portfolio' idea still persists to this day, some 50 years later. GSD became a thriving, successful, dynamic artistic community recognised by the Arts Council as part of the visual arts landscape in Ireland and recognised by artists as a commune where inexperienced and veteran printmakers; where master and pupil could work side by side.

Fast-forward, then, almost 50 years later. In 2007, experiencing growing pains and needing additional space to accommodate new equipment and to offer new, emerging printmaking techniques such as silk-screen, GSD now had its own CEO, its own Studio Director (a master-printmaker) and it had acquired its own gallery as a sales channel for artist members to both exhibit and sell their work. It decided to purchase new premises (see Figure 5) during the property boom in Ireland: a four-storey former granary close to the heart of the city on the northside of Dublin. To make the purchase, the organisation borrowed heavily. It had not owned premises before this one, it had been renting for the first 50 years, and the Board thought it was time to get a place they could consider home and call their own.

While the idea might have been laudable, the timing was catastrophic. It coincided with Ireland's first ever property 'bust', where property prices went into freefall, precipitating the deepest and longest recession in Ireland's history. The value of the property plummeted and the Board of GSD managed to negotiate a temporary 'interest only' payment arrangement on the property mortgage. However, the bank that owned the mortgage quickly sold it to a hard-nosed US vulture-fund who wanted to foreclose on the premises and to cast the artists out on the street. This would have left a generation of Irish printmakers without a place to work and without the facilities to make their art. The problems with the unsustainable mortgage were compounded by the fact that art purchases are among the first discretionary spends to get cut during a recession. People buy less art when their earnings are reduced, and hence, just when the organisation needed to show healthier revenues, its sales were drying up.

This is where the VUCA environment loomed threateningly over the enterprise, with few reasons for optimism and every avenue for revenue generation apparently drying up.



Figure 5. The four-storey converted granary, new printmaking studio for GSD.

Innovation in cultural organisations is considered generally to fall into one of four broad typologies [60,61]:

- (1) Marketing Communications (i.e., the use of digital strategies, specifically targeting key segments more directly with better, sharper, more personalised propositions).
- (2) Delivering the cultural experience in different or unconventional venues—like Shakespeare in Kew Gardens, for instance, or theatre in high street pubs.
- (3) New Cultural Content—perhaps adding comedy with art or blending two or more art forms and extending both into a new realm.
- (4) Operational Excellence—using conventional management practices and applying them to running the arts organisation and/or its events.

However, sometimes, these conventional approaches to innovation are unlikely to deliver the sort of turnaround performance that was needed in this VUCA environment.

A new Board of directors was empanelled in GSD to take up this daunting challenge and this is where the Art Thinking strategy took root. To save costs, the services of the CEO were dispensed with. The Board has nine members, of which the majority (5) are artists and the rest are volunteers, generally those interested in Art from the professions. In this instance, there is a chairman, a director of marketing and strategy (the author), a head of Legal (a bank property lawyer), and a head of finance (a chartered accountant in a large practice). The challenge for the new board was to restore GSD's finances to the extent to which it could afford to service the full payments on a mortgage—a reduced mortgage from the one originally taken out. This meant not only getting the business back into a healthier shape, it also required that the mortgage be renegotiated with, ideally, some debt forgiveness.

The situation was so dire that the Board really had to embrace the principles of Art Thinking: it did not seem to them as if it would be enough to plot a route from current position A to an incrementally

better position of A+. The Board just had to start with inventing a vision of what a desirable point B might look like in terms of revenues, audience numbers and costs. The Board decided to get all the artists on board to co-create a new, commercial strategy to pull the organisation back from the edge. Several artists (roughly 12) attended a Strategy Day in which a strategic North Star and set of guiding principles for the organisation were developed and several key effort priorities were agreed. The North Star was the organisation’s guiding purpose and the effort priorities represented the key deliverables underpinning it. After that, the entire membership was invited to a brainstorming session which was run in a world-cafe format; roughly 40 members attended, which represented around 75% of members. The delegates were given a briefing on Art Thinking and given problem statements, such as: *wouldn't it be great if . . . , or how might we . . . ?* Each table had to work through the effort priorities and give them some dimensions and suggest revenue generating projects that, while being imaginative enough to be exciting needed to be capable of being actually implemented. The brainstorming session was professionally facilitated by a consultant.

Inviting artists into the business planning process was also an unconventional (and courageous) step as artists invariably have a strong vision and point of view and they rarely pander to an audience’s tastes; rather they like to explore new territories and bring the audience on the journey with them. Nevertheless, this artist collaboration yielded a large amount of good and useable concepts, which the Board started to implement straight away. Many were great sales ideas. One prompted a themed artist-led and very profitable promotion called *100 by 100*, in which 100 members produced one piece (an etching or print) which had to be inspired by something in Ireland’s National Botanical Gardens, and they each made 100 prints of it. This was themed *the Botanicals*, as Dublin’s Botanical Gardens allowed the show to be exhibited there during their busy season, thus providing GSD not only with a new audience for original art but with a new exhibition venue.

Another initiative was the selection of a street graffiti artist (Dublin’s equivalent of Banksy) to come and make a series of prints in GSD (see Figure 6). This was a groundbreaking partnership, the artist, Maser, was well known for urban street art, and was an iconic figure in the youth market with a cult following on social media. To get Maser to make a series of fine-art prints was quite a coup for the studio, and the prints he produced sold so well and so fast that they broke all prior records.



Figure 6. A sample fine art print by street artist Maser—leading to record sales in GSD.

Others were that some of the artists' larger works were showcased in pop-up retail stores in some of Dublin's busiest shopping thoroughfares, such as the Powerscourt Townhouse Shopping Centre. New markets, new spaces and new audiences were being opened up through this strategy, and the sales were really feeling a dramatic lift. In searching to open up new and larger markets for Irish printmaking, the sponsor's portfolio was revived, and sales were made to institutional buyers like Yale University, Oxford University and in Ireland to the National Gallery and Trinity College.

The organisation also strengthened its Business to Arts partnerships and forged a deal with one of Ireland's biggest law firms to produce an original piece of art to go to their 750 best clients. This was a high-ticket, prestigious and profitable programme, putting original art into the homes of hundreds of well-paid business executives. Figure 7 shows the classification and the range of innovation activity that was undertaken at this time for the organisation. A lot of the activity focused on bringing the work to the attention of new and different audiences, especially people to whom printmaking was relatively unknown. A counter-intuitive feature of this case is that when threatened with the harsh financial crisis, rather than drawing in their horns: cutting costs and commissioning less work, the Board chose to do the opposite. They elected to take a different approach, to ignore the bleak reality and, instead, to imagine a different and better reality for the organisation. They began with plotting a strategic 'north star' and navigated towards this desired outcome.

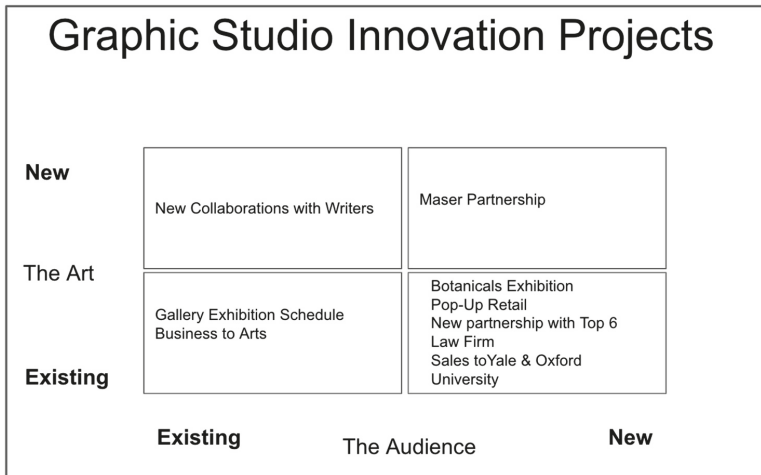


Figure 7. Classification of the Art Thinking projects developed and delivered by the Board.

4. Conclusions

The circumstances surrounding Graphic Studio Dublin did conform to the VUCA conditions. The future was uncertain; the twin engines of revenue were in freefall and the organisation faced an existential threat. Through this creative combination of developing new markets; developing better, more targeted marketing; getting new exhibition spaces; forging new partnerships, stretching across conventional disciplinary boundaries, little by little, the sales grew by over 100%. In addition, while all this activity was going on, the chairman was renegotiating down the debt with the vulture fund to the degree that they shaved off some of the outstanding balance because they could see GSD really pulling out all the stops to get the organisation back on its feet.

This is a valuable and possibly revelatory case of using Art Thinking in the Arts. Using Whitaker's [2] approach, there was:

- Clear designation of roles
- Placement of milestones or wayposts

- ‘Sprint’ scheduling of work over a relatively short period of time
- Flexible facilitation from the Board rather than close management

Had GSD used Design Thinking to try to resolve its problems, it would have merely amplified its marketing effort and put the customer at the heart of the strategy and finessed their needs in an attempt to find some promising route to an underserved or unmet need. The range of experiments that were tried using this approach wouldn’t have been as broad. It would have concentrated on doing what we do already, only better. A Design Thinking campaign would have used observation to focus on the GSD customer-journey. It would have honed in on pinch points in that customer experience map—such as the access or opening times of the gallery or the user experience of the website and started there—‘doing what we do already, only doing it better’. Thus, design thinking alone would not have produced the dramatic results made necessary by the crisis facing the organisation.

Laissez faire management, or a more facilitative style of management was key to the success of this project. Whitaker [2] uses the metaphor of baking a soufflé in the oven. Of course, the chef is tempted to open the oven door and see how the soufflé is doing, but the mere act of observation causes the soufflé to collapse. Although there is a strong temptation to constantly check in on things to see how they’re going, there are periods of time when management is better advised to resist that impulse. In managing this process, the quest of the Board was primarily for imaginative options and not for finished solutions and in this was several ideas were prototyped, tested and either canned or implemented.

Art Thinking is also more comfortable with the ambiguity inherent in the idea that the future is unknowable [61] for if it were otherwise an innovation would, in principle be already known and would have occurred in the present and not in the future. Popper [62] also notes that science is different and, in ways, much more straightforward. A scientist engaged in a piece of research, perhaps in physics, can attack their problem directly. They can go straight to the heart of the matter: to the heart, that is, of an organized structure. For a structure of scientific doctrines is already in existence; and with it, a generally accepted problem-situation. But, real world innovation problems do not generally have this helpful clarity about them.

This is the heartland of Art Thinking: when the boundaries are fuzzy and the outcomes uncertain. Madsbjerg [63] issues a passionate cry for humanistic, liberal arts thinking, believing like many others that over-reliance on data and algorithms creates enormous risks for employees, business and society. What all the data fails to capture, he says, is the critical nuances of culture and context that ultimately drive behaviour and lead the way to enduring innovation.

In summary, Art Thinking, with its focus on options, not outcomes; on possibilities, not certainty, was the ideal way to approach the very grave problems threatening the very existence of a core pillar in the Irish visual arts ecosystem. Art Thinking allowed the organisation not simply to plot a path from Point A to a more desirable Point B, but to collaboratively imagine or invent the ideal destination and to put in field a sufficient number of imaginative initiatives to get there. It seems highly appropriate to pilot Art Thinking in the visual arts and according to this case-study—it really does have something worthwhile to offer.

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Article

How Art Places Climate Change at the Heart of Technological Innovation

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Abstract: How can we place climate change issues at the heart of technological innovation? From our point of view, artistic practice is a powerful tool to infuse sustainability dimensions into technological developments. By using a sensitive approach based on a dialogue with his/her inner self, the artist questions the nature and meaning of technological developments and therefore appeals to users' deep motivations. We explore first how the artist inner self engagement in the creation process relates to climate change mitigation. Then, through a qualitative survey-type experimentation derived from Jeanne Bloch's art-tech installation, we expose how the confrontation with a panel of users helps to understand the characteristics of the dialogue an artist engages in with an "immersed" audience, particularly on the issue of climate change.

Keywords: art-thinking; choreography; climate change; dance; food culture; innovation; light design; light pollution; phenomenology; sustainability; visual art

1. Introduction

Knowledge specialization has resulted in a divide between so-called "scientific" and "artistic" research. Often, there is a top-down authority relationship between the two research types, with hard sciences and engineering knowledge holding the upper hand [1] (p. 9). Innovation-based economy relies mainly on technological knowledge [2,3], sometimes with the help of human sciences to uphold the process in order to validate technological developments in design and systems compliance. Occasionally, the artistic approach can also be associated with technological developments, mainly as a communication tool [4].

Our working hypothesis considers the artist as a "transmitter of signifiers" beyond the designer and the technologist as s/he refers to the collective unconscious [5] through the creation of imagery-based sensations and emotions. The artist talks about our "not yet unfolded world" as described by the philosopher Ernst Bloch in Hans Dieleman's paper [6] while incorporating his or her own subjectivity and vision [7]. As a result, says Dieleman, the artist helps us to imagine our future by connecting to our own subjectivity and imagination.

Neuroaesthetics, of which the "main objective is to characterize the neurobiological foundations and evolutionary history of the cognitive and affective processes involved in aesthetic experiences and artistic and other creative activities" [8] and other cognitive science fields have identified connections between the artist's gesture and embodied aesthetic experience whether we talk of visual art [9] or dance and performance [10]. All address the interaction with the art piece as a sensory experience. For the purpose of this article, we understand the "artist's gesture" as described by Hans Dieleman: A way for the artist to engage his/her inner self in the creation process, which is also considered as a condition in creating the required change of paradigm toward sustainable innovation and climate change mitigation (regardless of whether the artist's intention relates, or not, to sustainability itself).

We examine traces of the artist's gesture on developed technologies (Box 1) and with the audience of the studied art-tech installation—an interactive still life made of fruits and vegetables, which light up when touched by people (Figure 1). We question whether the artistic gesture would impact technological development of the art piece and how it would relate to sustainable innovation and climate change mitigation. We ask if artistic practice is a powerful tool to infuse ethical and sustainability elements within technological developments.

In our opinion, the materialization of the artist's vision and inner self engagement through works of art and furthermore, through interactive devices, helps in: (1) Taking into account non-mobilized features in mainstream innovation methodologies and (2) creating a qualitative dialogue with users and designers to generate subtle sustainable innovation indications.

Our research intentionally merges two very different approaches as an opportunity to examine intersections between art and innovation. Thus, each of the co-authors brings in some combination of skills: Céline Verchère is a sociologist, whose research focuses on new usages, and is also a dancer. Jeanne Bloch is both the creator of the artistic installation used for the survey, and the co-author of the research made from it. By writing this paper, she relates to a practice of self-reflection as used in research-creation methodology [11–15].

Box 1. Jeanne Bloch's observations during work in dance studios: (*Centre National de la Danse, Dance-tech Berlin, 2014*)

- Dancers' body-space awareness and movement skills offer a wide array of manipulation options;
- Technological objects developed in the context of the dance performance with active performers participation help to: 1/Test different parts of the body as actuators or as light projectors, 2/Investigate body space in a deep and structured way and experiment unusual movements interaction;
- Dancers provide detailed reports on how they feel emotionally and physiologically while interacting with the technological objects;
- The choreographer-artist primary focus is to create an experience rather than an object;
- The choreographer seeks to maximize effects rather than technology when developing art-tech set elements (for example, she considers light as a scarce resource rather than the energy needed to produce the light);
- A mix of low and high tech components are used;
- Human based art-tech developments are possible thanks to simultaneous collaboration between dancer-artists and software developers, merging the dance studio with the fablab;
- As a result, human factors are integrated within tech developments and technologies and bodies are considered equally as matter and part of a same entity.



Figure 1. Interactive installation, Cité des Sciences, (2017). Photo: Anne Charignon ©.

2. What in the Artistic Practice Can Help to Mitigate Climate Change?

We can identify four elements within the artistic practice that can help climate change mitigation. First, the artistic gesture based on the artist's inner self dialogue; second, the value of subjectivity in the creation process; third, the importance of leaving the audience free to experience the work; and fourth, the development of empathy.

Hans Dieleman's article *"Transdisciplinary Hermeneutics; Working from the Inner Self, Creating Ecologies of Knowing"* explains what Jeanne Bloch intuitively experienced during the artistic process. The artist who connects sensory experience during creation including technological developments helps the audience connect to their sensory and emotional spheres while interacting with the artwork.

Hans Dieleman describes the concept of the artist inner self engagement and how it contributes to "what the German philosopher Ernst Bloch called anticipative consciousness (...). To realize a dream and create a new reality, we need to be in touch with our emotions, 'want' and motivation and thus with our inner self". Ernst Bloch, as quoted by Hans Dieleman in the same article, vividly links the intimate process and the impulse that lead to creative action: "Connecting to our intimate world mobilizes our creativity and our imagination. Free thoughts are floating inside us which get turned into actions and impulses are energy to convert into actions these thoughts that live inside us as a result of our experiences".

From Ernst Bloch's description, we can deduce the notion of subjectivity as our imagination relates to our intimate world, which is infused by our past experiences as individuals: One cannot engage one's inner self without engaging one's subjectivity. In addition, the philosopher highlights the value of myths, folk stories, and tales as a qualitative and symbolic forms of our historical conscience [16–19]. The artist refers to the above when creating new signifiers and opening up the possibility for new worlds.

The artist relates to Ernst Bloch's "Principle of Hope [20] as a theory of the Non-there yet (...) as for Bloch the human world is full of latent worlds that tend to the concretization of the Utopia intention" according to Michael Lowy [21]. The artist's setup includes conditions allowing a space for latency. By creating surprise or featuring unexpected experiences, s/he is able to open up an imaginary space literally and trigger the audience's imagination.

In addition, the stimulation of empathy is key to the artistic experience: *"viewers of works of art report bodily empathy"*, according to art historian David Freedberg, who examined how relevant empathy is to aesthetic experience and what neural mechanisms are involved in the case of experiencing figurative as well as abstract art. Thus, could we consider the encounter with artwork as an opportunity to emphasize our empathetic nature? Would this contribute to building an intimate relationship with our "eco-surroundings"?

When, as Freedberg describes, the audience connects with the artist's gesture and when this gesture is based on the artist's dialogue with his or her inner self, could this specific gesture contribute to raising awareness about sustainability and climate change? Could it engage the audience?

In Jeanne Bloch's work, in the case of art and technologies, the artist's gesture and inner self engagement as well as the space for latency and empathy in her setup allow the emergence of new types of relations and connections between imagination and engineering, which is a relevant approach for engaging technological developments at the service of climate change mitigation.

3. Artistic Installation and Research Methodology

3.1. The Art Installation, "an Interactive Still life" Developed for the Choreographic Piece, "The Temple Windows Were Askew!"

In the specific case of the art piece that was examined for our research, the artist underlying considerations relate to:

- Intimacy and political action [22];
- Light pollution and low-emission lights as both metaphorical and technological proposition;
- The relationship between tech and organic matter.

The *Still Life* installation developed by Jeanne Bloch, is created as part of Jeanne Bloch's dance performance, *The Temple Windows were Askew!* and is presented, along with an interactive installation. It recalls chiaroscuro paintings and German expressionist film aesthetics. The installation features interactive fruits and vegetables that light up in different manners when you touch them. The performance developed from this installation includes additional objects such as several light projecting chairs installed on stage and three performers. A technological framework developed along the artistic creation runs the interactive lighting set. Jeanne's choice of using produce in her art piece is a step forward into her exploration of physical, organic, and technological frontiers. Her artistic approach apperceives technologies, human beings, and natural resources equally as matter and all as subjects. These operate according to the same universal physical principles that describe a single system of life and tech. In this sense, Jeanne relates to the *Metahumanist Manifesto* from Jaime del Val, artist-researcher, and Stefen Lorenz Sorgner, philosopher and specialist of ethics of emerging technologies [23]. In their work, del Val and Lorenz Sorgner lay the foundations for a world where new technological developments are human based. They propose, "to deepen the understanding of reality as an unquantifiable field of relational bodies or metabodies, in changing and constitutive relation with one another. Herewith, we attempt to finally overcome the Cartesian split between body and mind, object and subject, by proposing a view of the mind as an embodied relational process, and of the body as relational movement, that operates from the molecular and bacterial, through the individual and psychic, to the social, planetary and cosmic levels, and in other dimensions of experience".

At the time of our research, the light-produce installation included one Adafruit NeoPixel Jewel 7 × 5050 RGB LED and one Adafruit NeoPixel Stick 8 × 5050 RGB LED. Each group of LEDs is carved into a different fruit or vegetable after being protected from vegetable juice with a thermo-plastic envelope. For the presentation, we used cables to connect various produce to capacitive sensors and micro-controller. We are currently working on a wireless version of this project with different types of LEDs. In addition, Jonathan Perret, software performer (ut7.fr), developed a computer interface to control the lighting display (color variation and intensity). One part of the installation consists in manipulating "instrumented" produce displayed on a table placed in an obscure room. This particular context of manipulation (dark room, lighting effects) generates a series of reactions that are discussed with the audience. Then, we discuss the artist's intentions and research work and the participants' expectations and perceptions. Before stepping into the very dark room, one of the survey participants is invited to wear on a luminous t-shirt (Figure 2) helping the group to find its way to the installation in the completely dark room. The luminous t-shirts were developed during a previous dance and light artistic research [24] run by Jeanne Bloch. They include one or two 5 mm LEDs (blue or red or white) and some reflective and diffusing fabrics. A new version is in process in order for Jeanne Bloch to delve into her movement and light work.



Figure 2. Light and dance t-shirt. Photo: Jeanne Bloch ©.

3.2. Experiments

Jeanne Bloch, artist, and Celine Verchère, sociologist, set up two qualitative surveys “in situation” [25] in France in December 2017 and January 2018.

The two venues, Carrefour numérique—Cité des Sciences (Paris, France) and Le Shadok (Strasbourg, France), offered Jeanne Bloch to develop and present her artistic work and research. One of the venues, La Cité des Sciences’ Carrefour Numérique, frequently invites researchers to test prototypes with visitors of the science museum (three billion per year) but rarely invites artists. Le Shadok, a public art and tech center in Strasbourg, invited Jeanne Bloch to do an artistic residency (April 2017) in preparation for “Strasbourg Laboratoire de Demain” as part of the major “inter-museum” exhibit, “Strasbourg Laboratoire d’Europe”. (October 2017–February 2018). Interviews with visitors were set up while Jeanne’s art installation was featured during a visual art exhibit in Le Shadok, Strasbourg (France). Both venues have a “maker” culture and are open to interdisciplinary approaches and therefore welcomed our proposal to add an art and research dimension to our installation at their museum. While the installation was quite similar in both places, the enhanced artistic context in the case of the Shadok’s exhibit influenced some of the answers, and visitors were more inclined to express imaginary and creative ideas. The science museum (Cité des Sciences, Paris, France) seemed to be a more neutral place for our research, although interviewees were aware of the installation connection to a dance performance creation.

3.3. Methodology

The objective of both surveys aims to understand the type, as well as the modalities of the dialogue that could arise between the artist and the study participants. In that regard, our setup included an immersion in an art installation and a face-to-face qualitative interview (Appendix A). We favored a qualitative approach as our focus was to “understand phenomena such as the values, representations and meanings that social actors give to human life” as well as to “pay attention to the meaning of phenomena rather than their frequency”. We also looked at the type of dialogue that would emerge from an art-tech installation and whether this dialogue would lead towards sustainable development issues.

Our survey protocol included:

Participants’ visit and interaction with the art-installation without being previously informed about the survey purpose (5 min);

Participants’ interview about the visit: What they just experienced, felt, and the meanings they might give to it (10 min).

Thirty-eight participants or groups of participants were recruited, randomly and on a voluntary basis among visitors to “La Villette” Science Museum in Paris (Figure 3) and “Le Shadok” Art and Tech

Center in Strasbourg, France. In the Science Museum, we chose specific days when various activities were proposed to visitors, such as “Saturday repair cafes”, in order to reach a diverse audience in terms of socio-professional categories and ages. Recruitment has been adjusted and redesigned over time to increase the panel’s diversification so as to boost the number of female participants in the survey. People were walking past the glass room where the facility was located, and voluntarily chose to step in. We stayed at the facility during large time slots (from 09:00 to 18:30) to include various participants’ profiles in our research. Once engaged in the experiment, participants were asked to sign a use-of-data confidentiality protocol and an information and consent form for audio and video recordings. We filmed participants experiencing the immersive art installation to study their movements and verbal and non-verbal exchanges in the room. We then recorded the interviews by audio and video to facilitate their analysis and use.



Figure 3. Visitors interviews, Cité des Sciences, (2017). Photo: Anne Charignon ©.

In the end, 38 interviews were conducted. We did not anticipate that several people would simultaneously participate in the survey. Indeed, a total of 18 interviews were run in groups, either as a couple, a group of friends, or a family, ranging from 2 to 4 people. We will see that this element, once analyzed, enhanced our conclusions. In total, we interviewed 62 people, almost as many women as men (25 women against 30 men) and 7 children. The ages ranged from 7 to 69 years old. Individuals had diverse professional backgrounds, from journalism to sociology and mathematics.

This number of participants is relevant for a qualitative survey. We stopped conducting interviews when we reached saturation point in data collection: When new interviews were not providing us with new information or different ways of understanding our subject.

4. Results and Analysis Returns

4.1. Analytical Method

Our analysis is based on the grounded theory method, developed by American sociologists Anselm L. Strauss and Barney G. Glaser, and adapted by researcher and specialist in educational science, Pierre Paillée [26]. Indeed, inductive qualitative studies [27,28] allow for an exhaustive and effective conceptualization and provide an in-depth understanding of the concepts emerging from the analysis.

Grounded theory analysis includes seven stages: Initial codification of the participants’ comments; categorization of the codes identified in the comments; consolidation of the categorization; co-linkage of the categories; integration of the different concepts; modeling of the relationships between the concepts and the context of the experience; and theorization.

We applied this approach to our corpus in order to extract the relevant concepts. Based on the participants’ discourse, but also on the objectives of the survey, we worked more particularly on the analysis of the following four dimensions: Sustainable development, energy, the function of art, and

the relationship to light. At a transversal level, we worked on the following categories: Imagination; place of emotion; subjective elements such as memories and how participants relate to their personal life; and emerging questionings (how participants get surprised).

4.2. Significant Results

The presented analysis focuses on the question of the dialogue established with the artist. We will therefore not detail all examined categories.

4.2.1. Analysis Elements

Survey results did not show a meaningful link between a logic of discourse and socio-professional categories, the number of annual visits to the Museum where our installation was set up, or even participants whose profession relates to the survey's subject (Appendix A.1). The only difference we identified in relation to participants' profiles is cultural and relates to their country of origin: Survey participants who lived in Brazil and Western African countries where power outages are more frequent expressed a relationship to light and energy that was slightly different to other participants. However, this finding was not significant enough to be the subject of an analysis of its own.

Then, as pointed out in Section 3.3., we note that when participants experienced the art installation collectively and were interviewed in groups of 2 to 4 people, interview content was enriched as they were encouraged to debate and reflect further than when interviewed individually; especially when they were asked to relate their experience to sustainability, as we will see later in the analysis.

4.2.2. Characteristics of the "Art Installation + Experience + Interview" Setup to Organize the Dialogue

Our analysis of the dialogue developed around the artists' intention highlights the benefit of the installation operating on three levels:

- A level of engagement, setting in motion that the participants have to make a gesture to light up the produce;
- An aspect of the art installation triggers an emotional and imaginary level because it refers visually to still life painting;
- A cognitive mode that occurs during an interview completed at the end of the experiment.

Light was the concept the participants referred to the most with regard to the level of engagement. In 25 of the 27 interviews, participants evoked the possibility of using produce as a nightlight or as an alternative to traditional lighting. Survey participants mentioned these ideas in the artistic and technological contexts when developing ideas for luminous produce as well as when addressing what they experienced at the art installation. In the installation, organic elements were associated with technology. When participants touched the installation, they lit up the produce, arousing their curiosity. People were fascinated by the luminous experience and this notion of experience is essential to our understanding. The term "curiosity" was used in 17 of the 38 interviews studied. For example, in the first question of the interview, "if you had to describe what you just experienced, what would you tell? Emotions, adjectives?", some people answered by naming the emotion "curiosity!", "I felt, hmmm ... I felt curious and confused" and "yes, intrigued, it is clear!". Curiosity can be a leverage to facilitate open-mindedness and dialogue. Also, it is worth noting that out of 17 interviews mentioning "curiosity", 13 included the notion of movement such as a willingness to touch and to discover.

On an emotional and imaginary level, the installation triggered memory recall. Several participants in the experiment mentioned that the experience was similar to experiences they had in school. Twelve of the 38 interviews related this type of memory. People would say, "It reminds me of the power cables I used in school. You plug it in ... the voltage ... No, it's been a long time since I have done that ...". In addition, the art installation evoked a collective imagination through the mention of paintings and masterpieces, notably the work of Italian artist Giuseppe Arcimboldo (1526–1593). During the interviews, 22 of the

38 interviews declared that the experience was reminiscent of a still life painting, when asked if it reflected memories or artistic works. Some of the participants talked about “modern still life”, “fruit basket”, and “living still life”, integrating the luminous and interactive side of the experience with classic still life images found in paintings. In a few other interviews, individuals referred to the portraits made of fruits in the work of Giuseppe Arcimboldo but were unable to name these paintings precisely, for instance: “I don’t want to say the name, because I’m going to be wrong, but I am thinking of the portraits made of fruits . . . ” and “There’s this face with lots of fruits and vegetables, it really evokes that image . . . ”. This shared imaginary world brought up by the produce within the art installation as well as by participants’ projection of paintings featuring human faces enhances their commitment to the experience. Another interesting point is the impact of memories activation: When participants referred to memories during the interview, they were more likely to talk longer and in detail than participants who did not evoke memories. It seems that using the word “memory” stimulates the discussion.

Finally, the cognitive mode completed the experiment. Interviews played an important, if not decisive, role in developing a dialogue and a reflective approach to participants experience with the interactive art installation. The importance of the interview is due, in particular, to Question 5 of the questionnaire: “For you, is there a link between darkness, light, sustainable development: climate change and what you have just experienced?” This question opened up a space for dialogue. Before this question, except for two interviews, people did not link sustainable development and climate change to the installation. This question allowed us to move from the emotional and experiential dimensions to a more verbal and expressive one. Thus, half of the respondents only talked about sustainable development when the question about this concept had been asked.

These three dimensions of the setup—engagement, imaginary, and cognitive—were key to linking participants’ physical interaction with the art installation to the reflective mode: Movement stimulated by the interaction with the art installation provoked a great curiosity among participants; the artistic dimension, on the other hand, encouraged the emergence of memories and connected to a shared imaginary and the interview carried out afterwards allowed a “cognitive update” of the experience, encouraging verbal sharing and discussion. Moreover, participants who we interviewed in a group were more inclined to talk with us than individuals or couples. Lara Drew, an education specialist, when talking about embodied learning, explains that the body learns through specific contexts and then emotions are in charge to manage concepts [29]. We propose that this learning phenomenon occurred in our experiment. Indeed, our experiment was an important demonstration of the impact of movement and interaction on learning and of the value of verbal feedback after the experience.

4.2.3. Discussed Topics

- Sustainable Development and Climate Change:

Nineteen out of 38 interviews linked the experience of the art installation to sustainable development and climate change compared to 12 out of 38 who did not see any connection. Seven interviews did not address this question at all. The 19 interviews (individuals or groups) talked about sustainable development only when we asked the Question 4: “Is there a link between darkness, light, sustainable development: climate change, and what you experienced in the cabin?”. Only two interviewees addressed the subject before the question was asked. The question triggered participants’ reflection and brought it to a cognitive level, stimulating exchange when they finally recognized that the art installation could be linked up to sustainable development and climate change. Then, when going deeper into the conversation, the vast majority of interviewees associated sustainability with energy and light.

- Energy:

The term “sustainable development” is highly correlated with energy. Eighteen of the 38 interviews mentioned the term “energy” used in the sense of “renewable energy” and as alternative to polluting

energy sources such as oil and nuclear power. They also used this term in relation to lighting. Of these 18 interviews, 13 referred to sustainable development and climate change. Participants who did not connect energy to climate change mentioned energy sources in general. For example: *“perhaps if it was presented in another way, it could be an energy source, the fact that it is an energy source, indeed, but to say that I am going to buy an apple ... ”* or *“it is also extremely interesting to see, to discover, which food produces the most energy”*.

- Technological treatment of organic matters:

Eight interviews out of 38 contain references to genetically modified organisms (GMOs). Question 7 *“would you be ready to eat an illuminated fruit or vegetable?”* initiated these considerations. This question was deliberate and in line with the artist’s intention to express a form of continuity between organic and technical matters in order to question our relationship with technology. Participants then question the nature of light and think about GMO (genetically modified organism). Their reactions included: *“me, a priori, if someone tells me a fruit that enlightens, you eat it? Well, no! This is the big question of the demonization of GMOs!”*, *“I know it’s going to have to go through genetic mutations, but ... why not, huh?”* and *“the whole fluorescent thing, I avoid, anyway ... If they are genetically mutated and phosphorescent ... ”*. We note that their divide concerns, on the one hand, produce–nature and on the other hand, light–technology. For the majority, light did not modify their perception of fruits and vegetables, while eight interviewees raised the question of transformation of nature. For example, one participant felt that by watching the electrical wires on some of the fruits and vegetables, the experience was more technological than ecological: *“Each time you see electrical cables, I wouldn’t necessarily associate it with organicity, I would automatically consider it to be technological”*.

5. Conclusions

Our paper theoretically and practically demonstrates the contribution of artistic practice to technological developments, while assuming this practice brings about enough of a paradigm shift to lead to climate solutions. During our research, we have identified four characteristics of the artistic process that are likely to impact technological developments: The notion of inner self engagement, the value of subjectivity, the creation of a free space, and the opportunity of empathy. Then, we conducted a survey among the spectators of the artistic installation and examined the relevance to associate various channels of communication in order to establish a dialogue with the public:

- The experiential and interactive dimensions of the art installation promote learning through the body [30];
- The artistic setup, which includes touch, movement, and interactive technologies, stimulates participants’ imaginaries and memories and activates the emotional and sensitive components of the experience;
- The interview and associated discussion conducted after the artistic experience brings in a cognitive and reflexive element. Although the interview was originally intended only for research and investigation purposes, we noted during the analysis that it also stimulated learnings based on self-reflection. In addition, it raised dialogue in relation to the artist’s intention in regard of nature, technology, and sustainability issues. Furthermore, discussions were more intense and diverse when interviews were run with a group of participants instead of individuals.

Our research highlights the power of an art-based approach to increase the levels and possibilities of interaction with an audience by bringing together the sensory, imaginative, and cognitive dimensions.

Our approach opens, in a unique way, a new avenue between committed art [31], which immediately affirms a political and constant position, and augmented art [32], which uses technology in order to increase its own artistic vocabulary within its artistic media. In our case, the body is the main actuator of a space that articulates intimacy and social and political domains throughout

imagination, whether we talk about the body of the spectator at the time of the experiment or the artist's one during the creation process.

We do embody our trajectories and our relationships to the world, as described by Sylvia Faure and Anne-Sophie Gosselin: "the social speaks directly to the body by transmitting values, ways of being and doing that are reproduced by each other, without any objectification" [33]. In that sense, engaging bodies in artistic experiences opens possibilities to question contemporary values and ethics [34]. For Ernst Bloch, social differences are transmitted as well but throughout imaginations. For the purpose of this research, we have experienced, in an original way, the idea of the body and of the imaginary as transmitters of values in relation to the issue of climate change.

At the time of the artistic creation, the project of a research survey was not in the artist mind. On one hand, this situation had the advantage of leaving the artist free of working with her imagination regardless of its impact outside the piece of art. On the other hand, knowing about the research and analysis part at the time of the creation would have helped the artist to set up an adapted reflective framework that could have been used during the survey phase. Although our analysis of the artistic experience was detailed, we did not use dance movement analysis to deepen our understanding of the audience interaction with the art piece. In addition, in the case of a future research, we will think of improving the cross section of our sample. This was satisfactory for our present work, albeit we noted some influence based on the two different places where we hired research participants as well as variation in interviews conducted in group or individually.

Design and context in relation to the artist's own sensory experience allow us to experience often hidden or unspoken issues and to question the meaning of innovations. It opens up a space for dialogue and advances user's environmental consciousness as well as contributing to implementing innovation that transcends the idea of market need and seeks to connect to global needs that integrate human and nature.

This research is a tentative to understand the value of imagination and freedom as practical and rational tools adapted to climate change mitigation, which could relate, by its magnitude, to Ernst Bloch's idea of concrete utopia.

Author Contributions: J.B. is the author of the studied art installation. C.V. wrote the questionnaire with input from J.B. Interviews were conducted by C.V. and J.B. together during three days in Paris and J.B. conducted, by herself, the last day of interviews at Cité des Sciences as well as interviews run in Strasbourg (Le Shadok). Corpus analysis has been led by C.V., J.B. and C.V. wrote the paper.

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Appendix A.

Appendix A.1. Observation Form

The Different Objects and People in Place: Cabin, Curtains, Fruit Basket, Light, 2 Participants, Jeanne, Celine

a. Participants relation to the dark cabin:

When Getting into the Cabin:	Inside the Cabin (General):	When Getting off the Cabin:
Curtains etc	Body posture Eyes Movements	Eyes Face

b. Observation of the dark/light ratio:

How participants move, how they touch ...

Postural changes

Dialogues between participants, reports to the interviewers.

c. Description of how people interact with objects, what exactly does she/he do?

Movements performed

Observations of manipulation of fruit and vegetables

Observations of manipulation of luminous produce, which part of the body is being used?

d. How participants address (or not) these “inanimate” objects:

What exactly is said in the cabin

How do participants relate to the objects?

e. Interaction between the two participants in the cabin:

Frequency of interactions

Words exchanged

f. Learning and interaction dynamics:

Dynamics of participants interaction with objects

Dynamics of the interaction among participations

g. Acknowledge if the installation happens to dysfunction:

On what occasion?

What are the participants’, gestures?

Appendix A.2. Questions

- (1) If you had to describe what you have just experienced, what would you say?
- (2) Does the dark cabin inspire something in you? Does it echo something?
- (3) Does the overall scene echo artistic works (drawing, painting, etc.)?
- (4) For you, what is the “subject” of what you have just experienced? Is there a link between darkness, light, sustainable development (climate change) and what you experienced in the cabin?
- (5) For the person manipulating the produce: how do you feel about a luminous fruit or vegetable?
- (6) With regard to your gesture: have you changed anything because of the light setting and the darkness within the cabin?
- (7) In a different environment, would it have the same effect? For example, imagine yourself in your kitchen: would you see this lighting technology being used in your kitchen? In other contexts? Is it transposable for everyday use?
- (8) For the observer: does this change the way of looking at produce? Did you need time to understand what was going on?
- (9) With regard to this T-shirt: do you have anything to say? Do you think it is of interest in this context? For what?
- (10) Finally, do you think this facility is a technological facility?

Appendix A.3. Additional Questions for the Shadok Audience

What You Have just Seen/Experienced is Part of a Performance that will be Presented soon (Scenic Object Which is Part of the Plot of a Show). A Video Related to the Dramaturgy of the Show is Projected on the Dark Cabin:

- (11) In relation to what you have just seen, do you have anything to say?
- (12) In your opinion, what is the artist's intention?
- (13) Does this affect you?
- (14) If you can imagine, play with what you have just seen and experienced, what would you feel like doing? Any gestures? Movements?
- (15) Would you like to ask the artist one or more questions?

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