

Article

The Artist as Innovation Muse: Findings from a Residence Program in the Fuzzy Front End

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Abstract: In a highly competitive business environment, integrating artists into corporate research and development (R&D) seems to be a promising way to foster inventiveness and idea generation. Given the importance of individual level innovation for product development, this study explores the benefits that employees experience from the artist-in-residence-program at Robert Bosch GmbH, Germany. Qualitative content analysis of interviews with scientists and engineers was performed in order to explore the impact of their encounters with artists in the theoretical framework of the triadic concept and transmission model of inspiration. The findings corroborate the notion that inspiration is a suitable theoretical underpinning for individual benefits of art–science collaborations in the front end of innovation. Scientists and engineers are inspired by the artists’ otherness and transcend their usual modes of perception in favor of enhanced focal, peripheral and bifocal vision. Whereas shifts in perspective are reflected in individual thinking patterns, researchers are hardly motivated to change their work-related behavior. The exchange with artists does not have a concrete impact on technological innovation, because researchers neither integrate impulses into their experiential world nor link them to fields of activity. In the case under scrutiny, artistic impulses do not contribute to idea generation in the sense of front-end activities. The study contributes to research on artists in businesses by illuminating the R&D environment as a hitherto neglected field of activity. While substantiating previous research on artist-in-science-residencies, the results suggest that the potential of such interdisciplinary endeavors is limited.

Keywords: artist-in-residence; artist-in-science-residency; art–science collaboration; front end of innovation; innovation; inspiration; research and development

1. Introduction

In ancient mythology, the nine daughters of Zeus and Mnemosyne, the Muses, used to breathe divine inspiration and insight into humans. Respiring, whispering and singing, they inspired science, poetry and the arts (Hart 1998). In modern times, muses are a metaphor mainly associated with artists who are stimulated to creative work by men and women in their environment (Tutter 2016). Over the last decade, artists themselves have turned into muses in a way and are supposed to be catalysts for business innovation of any kind (Darsø 2009; van Rosmalen 2016).

As they are representing a creative professional group, per se, artists have become role models for leadership and inventiveness (Adler 2006; Hatch et al. 2006; Ladkin and Taylor 2010). The arts as such have become a metaphor for organizational processes (Weick 1998; Cornelissen 2004) and the artistic process has served as a blueprint for agile methodologies (Austin and Devin 2003). Whereas the essence of choreographic practice was linked to radical innovation (Bozic and Olsson 2013), the sequence of events in the front end of innovation was captured musically in the composition process (Tran et al. 2018). The artistic mindset is esteemed for disruptive ideas as well as non-analytical, intuitive and embodied paths to knowledge (Kuiper 2012; Jacobs 2018; Sandberg 2019), which—in an analogy to Design

Thinking—has been roughly conceptualized as Art Thinking (Whitaker 2016; Jacobs 2018; Robbins 2018) and as such been associated with product development (Nobeoka and Kimura 2016) and systems engineering (Shima et al. 2019).

Borrowing from the art world is a side effect of the emerging knowledge society (Stehr 1994). Creativity has become a key resource for business innovation (Amabile 1996; Mumford 2000; Florida 2002) and is considered a decisive asset used by companies to differentiate and compete effectively in an increasingly volatile, uncertain, complex and ambiguous world (Jeffcutt and Pratt 2002; Stiehm and Townsend 2002; Damanpour and Aravind 2012; Bennett and Lemoine 2014). Against this background, companies increasingly seek ways of collaborating with artists, thus establishing endeavors that promise mutual benefits beyond mere arts promotion (Schiuma 2011; Smagina and Lindemanis 2012; Carlucci and Schiuma 2018).

Regarding the functional business administration areas involved, such collaborations basically fall into three areas. The first, which is related to human resources and organizational development, includes a variety of manifestations of artistic interventions or arts-based initiatives, where artists enter companies in order to trigger both individual arts-based learning and systemic changes (Nissley 2010; Schiuma 2011; Berthoin Antal 2014). The second area covers contract work around marketing issues from product and packaging design to communications and branding (Hong and Hwang 2013; Baumgarth 2018). A third and comparatively marginal area in terms of public awareness and academic interest refers to integrating artists into corporate research and development (R&D) as a form of art–science collaboration.

Collaborations between researchers and artists differ in reference to stages of the innovation process with the fuzzy front end, new product and process development and commercialization (Smith and Reinertsen 1991; Cooper 1996; Murphy and Kumar 1997; Koen et al. 2001). Some are embedded in the front end, the early phase of discovery, idea generation and opportunity recognition (Stüer et al. 2010a), such as the *Microsoft Research Artist in Residence* program. In this context, artists, scientists and engineers jointly explore new and emerging technologies before market maturity. Other initiatives, such as Google's *Tilt Brush Artist in Residence*, are put on the downstream phase of product development and encourage artists to test and enhance product applications.

Most collaborations are framed as artist-in-residence programs, also referred to as artist-in-science-residencies (Farman et al. 2015). In general, residencies are stimulating retreats with good working conditions, as they grant artists a temporary relocation and a break from everyday life. Aside from time, residencies may provide financial, spatial and social resources for reflection and untroubled artistic work (Lehman 2017; Lithgow and Wall 2017). In an R&D context, residencies offer access to high-end technology and staff expertise; artists are expected to explore research topics and to deliver company-related artworks in return. Usually, art–science residencies run for several months, thus giving expression to the strategic nature and intended public visibility of the company's engagement. Other ventures are less formal and run for shorter periods of time.

In any case, a central feature of innovation-driven artist collaborations is providing artists access to expertise and equipment and fostering interdisciplinary exchange with R&D staff. This interplay usually starts from the technical support and expert advice which R&D employees grant to the artists while these are creating a work of art based on relevant material or the respective technology. Regarding the area of research, joint efforts in materials science, such as the *Arts/Industry* residency program hosted by Kohler Co. and the *Artist-in-Residence* established next to Corning, seem to be less prevalent than collaborations based on information and communications technologies as, for example, with Nokia Bell Labs and Planet Labs.

From a business point of view, art–science collaborations aim at both communications and product innovation. They allow for conveying technological progress to a wider audience, thereby relating to actual and potential customers as well as to the general public (Plautz 2005; Hindi 2016), and contribute to corporate image cultivation (Shanken 2005). However, the key motivation behind art-related ventures in R&D is fostering creativity and idea generation in exploring new areas instead of exploiting hereditary

fields (March 1991; Li et al. 2008; Stüer et al. 2010a, 2010b). Art-related initiatives are not expected to generate tangible results and marketable products but to contribute to an innovation-friendly corporate climate where both customer needs and societal demands are taken into consideration (Plautz 2005; Hutsteiner 2019).

“One of the critical ingredients of innovation is the source of the idea or inspiration for the innovation” (Bommer and Jalajas 2004, p. 13). Idea generation has been attributed to inspiration both in general (Drucker 1999) and in relation to specific research areas (e.g., Drelich et al. 2018; Mead et al. 2020). Inspiration exists in new product development and design (Halskov and Dalsgård 2006; Vasconcelos et al. 2017; Brun et al. 2018) as well as in earlier stages of the innovation process. Patent holders are demonstrably inspired more often and more intensely than people outside of research and engineering (Thrash and Elliot 2003). In large technology-based companies, product ideas usually stem from various sources inside and outside of the company, with customers, internal R&D, co-workers and competitors being the most significant. Many impulses are based on informal communication between engineers and other actors (Bommer and Jalajas 2004). By inviting artists, companies add a promising facet to this existing spectrum of potential sources of knowledge and inspiration.

The present study seeks to illuminate the value of embedding artists in R&D as a hitherto neglected aspect both in innovation literature and the discourse on artists in businesses. It seeks to expand research on art–science collaborations by exploring if and how R&D employees working at the front end of innovation are inspired by an exchange with artists-in-residence. In other words, the paper examines to what extent the theoretical construct of *inspiration* displays explanatory power in the context of a corporate art–science collaboration.

As a company’s capacity to innovate is primarily based on employees’ mindsets, skills and behaviors (Carlucci and Schiuma 2018), art–science collaborations are supposed to contribute to an environment that facilitates disruptive thinking and allows employees to unleash creative action (Stüer et al. 2010a, 2010b). Therefore, research on the impact of art–science collaborations on product innovation starts with individuals’ ability for idea generation and problem-solving (Scott and Bruce 1994; Ramos et al. 2016; Palazzeschi et al. 2018). Turning to an assumed influence on organization culture and collective sensemaking—more difficult to detect—is a second step. Another reason for limiting the scope of this study to the individual level of innovation is that the state of knowledge on art–science collaborations embedded in R&D environments is poor, as will be demonstrated below.

Data were collected by interviewing researchers belonging to the Corporate Sector Research and Advance Engineering division at Robert Bosch GmbH, a global technology corporation based in Stuttgart, Germany. As Bosch operates in a highly competitive environment in which capacity for innovation is a key factor of success (van den Ende et al. 2015), the R&D division’s innovation management addresses the company’s innovation culture and sets creative stimuli for its employees, including an artist-in-residence program. “We need one hundred ideas for one to take off” (Birgit Thoben, Director Innovation Management Global, Robert Bosch GmbH, until 2018 and responsible for the program’s launch qtd. in Wolfangel 2016). This general statement on the company’s quest underlines both the importance of idea generation in the fuzzy front end (van den Ende et al. 2015) and the central role of individuals in promoting useful insights (West and Farr 1989; Scott and Bruce 1994; Bellis and Verganti 2020).

The paper is structured as follows. Section 2 introduces well-known cases of artist residencies embedded in R&D and elaborates on the fragmentary state of research.¹ Section 3 resumes the essence of reports and empirical research on the presented cases by introducing the concept of *inspiration* as an explanatory framework to be scrutinized in a more comprehensive empirical study. Along with comments on methodology, the artist-in-residence program at Robert Bosch GmbH is presented in

¹ Due to the research topic, the overview is limited to residencies in an R&D environment. For a more general summary on corporate art–science residencies, see Sandberg (2020).

Section 4 as a potential source of inspiration for Bosch researchers. Interviews with both scientists and engineers involved were submitted to thematic analysis, whose results are described and discussed in Sections 5 and 6. The findings support presuppositions on the artists' impact as modern research muses but qualify expectations on feasible impulses and tangible results.

2. State of Knowledge on Artists Adding Value to R&D

Expectations on involving artists in the innovation process are high. They are nourished by the artists' standing as highly creative persons (Styhre and Eriksson 2008)—although evidence of individual learnings and organizational benefits generated by artistic interventions such as intensified reflection, a change of perspective and an enriched organizational culture (Berthoin Antal and Strauß 2013, 2016) do not inevitably apply to collaborations with R&D. Their scope and objective as well as the artists' role are completely different.

Reports and empirical evidence of the added value that artists bring into the process of product innovation are scarce. The following propositions come from corporate representatives responsible for R&D collaborations with artists, one case study and one cross-case analysis.

One of the first cases to be documented (without scientific scrutiny) is the Xerox *PARC Artist-in-Residence Program (PAIR)* at Xerox's Palo Alto Research Center, which ran from 1993 to 2000. The program paired artists with engineers for semi-annual or year-long collaborations, thus creating a blueprint for similar corporate concepts. The artists involved in the program at Xerox PARC "revitalize[d] the atmosphere by bringing in new ideas, new ways of thinking, new modes of seeing and new contexts for doing" (Brown 1999, p. xiii).

Three years later, Intel took a different approach and allied with university departments in art and film studies in order to support selected up-and-coming young artists with state-of-the-art technology from their labs. As prototypes became the starting point for artworks, new technologies were publicly shared and tested by end users. Due to anecdotal evidence, the venture inspired new applications and novel uses for devices. As Intel's staff in corporate, engineering and technological divisions advised the artists and accompanied their endeavors, mutual knowledge sharing brought in unusual perspectives, helped create new technologies and changed aesthetic standards (Plautz 2005).

The *Pier 9 Artist-in-Residence Program* at Autodesk, which ran from 2012 to 2018, did not only address artists but creatives in general. *Pier 9* was meant to integrate external expertise and to ground future products and workflows in residents' user experiences and feedback. After initial training in manufacturing technology, the residents were invited to work with tools under development and to explore new applications. The exchange with Autodesk's developers, who supported the residents' creative projects, fostered an informal "cross pollination of ideas" (Hindi 2016, par 12).

Nokia Bell Labs' partnerships with the artist community are rooted in the pioneering performance series *9 Evenings: Theatre and Engineering* initiated by Bell Labs engineer Billy Klüver and artist Robert Rauschenberg in 1966. The event involved ten renowned artists such as John Cage, Lucinda Childs and Rauschenberg himself along with some 30 engineers and scientists from Bell Labs. Moreover, *9 Evenings* led to *Experiments in Art and Technology (E.A.T.)*, a collective with a large membership that was active from 1967 until the 1980s. Nokia Bell Labs revived *E.A.T.* in 2016, now providing long-term residencies and short-term opportunities for artists to collaborate with engineers and scientists as extended team members. Artists are invited to develop performative works based on novel tools and emerging technologies provided by the company (Nokia Bell Labs n.d.). The artists bring in other dimensions on research issues which engineers are not trained to perceive, like backing up technology with philosophical questions and a human-centered approach to thinking (Kitson 2019). "They help us get out of our engineer or scientist myopic mindset around the technology itself and they help us bring the human into it" (Barcia-Colombo 2018, 22 min 14 s).

Vodafone Group R&D involved artists in the discovery of radical innovations by having them create works of art with reference to telecommunication technology. With their ability to mirror society, artists were considered seismographs for emerging trends and latent customer needs. Artists resemble

unconventional lead users who point out technological applications yet concealed. Supporting the artistic process should bring researchers in touch with transdisciplinary methods and “create inspiration and creativity” (Stüer et al. 2010a, p. 15). As artists are prone to disrupt thinking patterns, used to questioning established routines and following an open-ended creative process, they are supposed to improve inventiveness. “Specialists benefit, as they leave their mindset, perceive new perspectives and learn to approach their challenges with new methods” (Stüer et al. 2010a, p. 16). The elaborated case study suggests the proposition that transdisciplinary collaborations with artists improve R&D’s capability to identify radical innovation (Stüer et al. 2010a, 2010b).

Schnugg’s explorative study on art–science collaborations (Schnugg 2019) comprises 18 cases based on 58 interviews altogether, among them 15 with program managers and 18 with scientists. Her findings suggest that art–science collaborations improve organizations’ ability to explore and discern innovation opportunities, although effects at corporate level are subtle and difficult to trace (Schnugg and Song 2020). Art–science collaborations provide “liminal spaces for experimentation” (Schnugg and Song 2020, p. 7) and contribute to an environment that enables employees to develop an innovative mindset to the full. Schnugg’s five-point catalog of individual benefits for researchers involved can be broken down into three dimensions (Schnugg and Song 2020; see Schnugg 2019, for an extensive representation):

- (1) **Sensemaking** The interdisciplinary collision of values, approaches and work methods reveals layers of meaning and changes perspectives on given issues including the context of research and one’s own work.
- (2) **Social networks** The interdisciplinary nature of the encounter has researchers expand relations beyond their original professional domain.
- (3) **Skills acquisition** Both the aesthetic dimension of artistic work and the need for intercultural interaction enhance proficiency in problem-solving, communication and cooperation.

Only one solitary case in Schnugg (2019) sample, Nokia Bell Labs, represents a corporate partner with an artist-in-residence program explicitly attached to R&D and reserved for professional artists alone. In the case of Planet Labs, the connection to the company’s development teams is less exclusive. Moreover, the above-mentioned program at Autodesk and the *Ginkgo Creative Residency* was or is open to a wider range of creatives. These limitations qualify the validity of Schnugg’s findings for the corporate R&D context and an assumed influence specific to artists.

All cases share the observation that artists who enter R&D departments support the innovative process in terms of idea generation as they deliver food for thought, stimulate a change of perspective with scientists and engineers and improve their perceptive faculty.

This notion relates to similar statements on artistic influence beyond the innovation context. Artists enhance others’ sensory perceptions of the environment by listening and looking more closely and by stimulating a change of perspective. They may encourage realizing subconscious phenomena and focusing on issues that tend to be pushed to the back of one’s mind (Schein 2001; Barry and Meisiek 2010). As they are prone to asking unconventional questions and to alienating familiar settings, they “can give people a mental kick that jiggles their mind-set so that they are suddenly able to see differently” (Darsø 2016). Such impulses for reflection point to the concept of inspiration as a possible framework for individual effects of encounters with artists.

3. Conceptualizing Inspiration

According to the *Oxford English Dictionary*, the figurative sense of the term *inspiration* lies in “a breathing in or infusion of some idea, purpose, etc. into the mind; the suggestion, awakening, or creation of some feeling or impulse, especially of an exalted kind; appreciation of new or better possibilities . . . , passive evocation . . . , and motivation to bring the new possibilities into fruition” (Inspiration 1989, p. 1036).

In an effort to consolidate definitions from various domains, Thrash and Elliot (2003) suggest a tripartite conceptualization of the state of inspiration close to this linguistic definition, with evocation,

transcendence and approach motivation as core elements. In this triad, evocation represents the fact that inspiration episodes do not succumb to individual volition but are triggered by an external stimulus such as a person, an object or an idea. Inspired individuals are clearly aware of new or better possibilities that vividly transcend their ordinary personal life and experiences. Inspiration entails the motivation to transmit or convert the insight into action targeted at one's future self-concept, a personal goal or a creative product. Thus, it is conceptualized as an appetitive motivational state known also as state inspiration (Thrash and Elliot 2003).

A component process conceptualization of inspiration highlights two distinct phenomena: a relatively passive process of *being inspired by* and a relatively active process of *being inspired to*. The first involves appreciation of the perceived intrinsic value of the stimulus and gives rise to evocation and transcendence, whereas the latter stands for an approach motivation to transfer valuable characteristics of the stimulus to another target (Thrash and Elliot 2004).

Inspiration denotes a process of understanding that goes along with gaining a wider perspective (Hart 1998). The dominant theme in inspiration narratives is "having one's eyes opened during an encounter with a person, object, event, or idea (i.e., being inspired 'by'), and wishing to express or actualize one's new vision (i.e., being inspired 'to')" (Oleynick et al. 2014, p. 2).

Under ideal circumstances, including the individual's available latitude to react, being inspired by some sort of elicitor is followed by an effort to transmit the obtained understanding from its trigger to a new target (Thrash and Elliot 2004; Oleynick et al. 2014). Transmission may be carried out via replication, actualization or expression (Thrash et al. 2014). In replication, an existing object undergoes "re-expression in the form of a creative product" (Cui et al. 2020, p. 663). During actualization, an insight or seminal idea is transformed into a completed creative product (Thrash et al. 2010). Expression stands for a swift sensorimotor conversion of insights or feelings (Cui et al. 2020).

In the functional model, as described above, an idea is not the result of inspiration but its initial impetus, followed by an urge to actualize it (Thrash et al. 2010). Alternatively, in other words, inspiration is not the origin of creative ideas but a motivational response to them. Thus, the transmission model does not posit inspiration as the source of creativity but explains the transformation of creative ideas into creative products (Oleynick et al. 2014; Thrash et al. 2014).

In the context of inspiration, compelling ideas are not willfully developed but groundlessly received (Thrash and Elliot 2003). "Inspiration . . . is a motivational state [that] can occur outside of the problem-solving context and without a discrete and sudden insight" (Oleynick et al. 2014, p. 4), which is oftentimes associated with illumination or a eureka moment (e.g., Wallas 1926). Despite the rather passive nature of *being inspired by* as evoked and unwilling, inspiration "favors the prepared mind" (Thrash and Elliot 2003, p. 886) that is an understanding of the field or issue under consideration. Openness to experience is both an antecedent and a consequence of inspiration—or, more precisely, trait inspiration (Thrash and Elliot 2003; Thrash et al. 2014)—and inspiration predicts creativity (Oleynick et al. 2014).

Applying the triadic concept and the transmission model of inspiration to artists who collaborate with scientists and engineers gives rise to several assumptions. Artists may evoke insights that guide action and serve as potential role models. Likewise, notions and observations of the artistic process and artworks created in the R&D environment may be inspirational triggers. Researchers are motivated to integrate new vistas into their (work) behavior and assessment standards for objects, projects and procedures. The present empirical study seeks to explore these assumptions.

4. Methodology

4.1. Research Approach

As the theoretical and empirical state of knowledge about the impact of artists in corporate R&D settings is low, the present study pursues a deductive–descriptive objective based on an acknowledged conceptualization of the inspiration phenomenon, which is supposed to capture anecdotal evidence

and qualitative studies at hand. The study follows a qualitative approach, because the research question suggests the exploration of participant experiences and attitudes within the data. Moreover, the qualitative research approach allows propositions concerning artists' impact on employees in a R&D environment to be developed (Eisenhardt 1989).

The study is based on a single case, recognized as an example for art–science collaborations in the form of a corporate residency program. The case offers rich and concise information (homogenous sampling) for the research question and a sufficient base for logical generalization (Patton 1990). In addition, it represents an unusual framing (extreme case) (Yin 2014) as it is one of the very rare examples in which artists are embedded in the front end of innovation.

4.2. Research Context

The case under scrutiny is the artist-in-residence program at Robert Bosch GmbH, a global technology company based in Stuttgart, Germany. In Bosch's Corporate Sector Research and Advance Engineering division, technologies that are relevant for various business units and applications such as artificial intelligence are developed. To support the front end of the innovation process, the company's overall innovation management is backed up by a division-specific innovation management system.²

In 2015, Bosch opened a newly constructed campus for research and advance engineering in Renningen near Stuttgart with approximately 1900 employees onsite. The complete top floor of the central building, the so-called *Platform 12*, was designed as a creative area for critical reflection, inspiration and idea generation. The centerpiece of *Platform 12* is the *Base*: an approximately 450 square meter area conceptualized by artist duo Wimmelforschung, Maren Geers and Thomas Drescher. The two stage designers created a space full of unconventional objects, breaking with the usual office design in terms of area division, functionality, changeability and furnishing (Geers and Drescher 2017).³

Right from the start, Bosch's Corporate Sector Research and Advance Engineering division has invited artists on campus. The residency program is a collaboration with renowned Akademie Schloss Solitude, a nearby international artist-in-residence center, and Wimmelforschung. Until April 2020, 19 fellows from the visual and performance arts along with an architect and a designer have been working at Bosch for three or four-month stints each. As the artists are not expected to provide an artwork in return, the residency is officially labeled as a *fellowship* (*Wimmelforschungs-Stipendium*), although it has characteristic features of a residency. Applicants are expected to stay on *Platform 12* for five days a week during typical working hours and get in touch with researchers for an interdisciplinary exchange—an endeavor that is facilitated by Bosch's innovation management team but not subject to targeted matching beforehand. Therefore, artistic endeavors are—if at all—only loosely coupled with questions Bosch researchers are working on and encounters are consistently informal. In the past, artists dwelled on artistic research and production onsite that was more or less a reaction to the corporate environment. Bosch researchers were involved in the creation of several artworks by providing expert knowledge, technical support or mere presence as models.⁴

“The aim . . . is to establish a new form of innovation culture through the exchange of thoughts and ideas between the worlds of research and art” (Akademie Schloss Solitude 2017). The artists are expected to be independent observers who reflect the company's structures, culture and research themes in their activities onsite. Insofar, the program shall bring researchers in touch with new ways of thinking, challenge their intellectual comfort zone and change their perspectives (Akademie Schloss Solitude 2016; Geers and Drescher 2017). “We want to lure researchers away from familiar frames of

² Unless stated otherwise, information on Robert Bosch GmbH was provided by expert interviews with Cordula Schumacher, Director Innovation Management Global, and Lisa Przioda, Information Manager Innovation Management Global, at Robert Bosch GmbH, Stuttgart (DE).

³ The *Base* is featured in a short promotional film that is available under <https://vimeo.com/267572475>, with the insight view starting at 2 min 38 s (retrieved 25 October 2020).

⁴ Most of the artists-in-residence at Bosch are featured in shorts presenting both their work and researchers they encountered. The shorts are available under <https://vimeo.com/akademiesolitude> (retrieved 25 October 2020).

reference. Via discourse with people from a different environment, we want to confront them with different thinking in order to open their view and world of ideas" (Cordula Schumacher, Director Innovation Management Global, Robert Bosch GmbH).

At Bosch, idea generation, evaluation and refinement follow a stage-gate approach and are supported by a database (Cooper 1996; Nichols and Bräuer 2019). Although the artist residency is formally integrated into the company's innovation management, it is somewhat decoupled from the usual front-end routines. Ideas that occur to the researchers because of their encounter with artists are neither registered nor tracked. In addition, Bosch intentionally abstains from measuring the program's overall impact in order to provide researchers with a sheltered niche for untrammled exploration. Nevertheless, *Platform 12* and the residency were introduced with the notion that they would support ideation and invention.

4.3. Data Collection and Generation

Data were collected through semi-structured interviews, which are well suited for under-explored areas as they provide rich data and support hypothesizing. The interviewees were recruited from a group of 22 engineers and scientists at Bosch who are known for being repeatedly and directly in touch with one or several artists through conversation or temporary collaboration on artistic endeavors. In total, 17 researchers were willing to take part in the study. Employees who had only attended in-house presentations given by the artists were not included in the selection.

Statements that referred to an architect and a designer, who were among the fellows as well, were excluded from analysis later on in order to strictly focus the study on artistic influence. This decision contradicts the program's wide interdisciplinary approach but is legitimized by the fact that the creative process of designers and architects differs from the artistic process and its underlying mindset (Englisch and Sachse 2006; Glaveanu et al. 2013) so that effects of an encounter might deviate.

The questions in the interview guide were aligned with the concept of inspiration without explicitly addressing it. The interviewer avoided the term so that the participants would not be influenced in their response behavior. The interviewees were asked to describe the occasion and nature of their encounters with artists. Aside from this, the questions addressed perceived differences in working style between engineers and artists, effects that meeting the artists had on the researchers' work, personal insights and attitudes (see Table 1).

Table 1. Sample questions from the interview guide.

■	When you think of the artists at Bosch, what do you think of in the first place?
■	Please recall your encounters or collaboration with artists. What was your role in that and what did the artists bring in?
■	Which striking or enlightening moments do you recall?
■	How did meeting the artists affect your research process or specific projects you were working on?
■	How did you personally benefit from the encounter?
■	Would you like to collaborate with artists more intensely?

Initially, a close examination of the artist residency that proceeded during the field phase was planned. Researchers should have been asked to keep a diary of interactions and reflections via voice memos. This approach was abandoned, because the respective artist did not succeed in building up sustained relationships with Bosch employees; the research campus was subject to a partial shutdown due to the COVID-19 pandemic from March 2020 onwards. A subsequent quantitative study—a complete survey of all 1900 employees on location that was meant to test hypotheses developed from thematic analysis—was cancelled for the same reasons.

Informed consent was given from all participants. In this connection, the interview partners were assured that the data would be treated confidentially and not be made accessible to Bosch in particular.

The 17 interviews, which took approximately 45 min on average without introductory remarks on the study itself, were conducted via video calls between 24 February and 24 March 2020.

The digital voice recordings were anonymized and submitted to a semantic transcription according to scientific rules; the interviews were transcribed literally, but linguistic peculiarities such as dialect, affirmative utterances and shortcut articulation were left out to smoothen the text (Dresing et al. 2015).

4.4. Data Analysis

Given that the analysis aimed at attaining a condensed and broad description of the phenomenon and followed prescriptive research questions, qualitative content analysis was performed. As content analysis is supposed to condense and structure information in the provided data, it is well suitable to learn about descriptions of social circumstances (Mayring 2014).

The interview material was reviewed by reading the transcripts thoroughly and cross-checking with the audio recordings. The ensuing coding process was performed through the software program MAXQDA. According to the study's objective to explore the explanatory power of inspiration for individual effects of specific art–science collaborations, the code system was developed through a hybrid deductive–inductive approach, which allows for refining initially concept-driven analysis (Fereday and Muir-Cochrane 2006; Kuckartz 2014).

First-cycle coding (Saldaña 2013) was concept-driven and operationalized on previous knowledge (Elo and Kyngäs 2008). The state of knowledge on collaborations with effects on researchers' awareness, propensity to reflect and shift their perspective as key assumptions was linked to the concept of inspiration as a potential explanation of these phenomena. Consequently, an initial code system was derived from the tripartite conceptualization of inspiration (Thrash and Elliot 2003), with *evocation*, *transcendence* and *approach motivation* as generic categories or top-level codes.

Statements were selected from the interviews as relevant for the research question along these theoretically pre-formulated categories and coded accordingly. The category system was structured so that only corresponding data were included in the analysis. Regarding idea generation, which is central for innovation in general and a concept-specific objective of Bosch in particular, negative statements were registered explicitly (Elo and Kyngäs 2008).

Whereas first-cycle coding provides an initial approach to the data and explicates previous knowledge, second-cycle coding reveals finer patterns in the material (Saldaña 2013; Stamann et al. 2016). In this case, second-cycle coding was data-driven in order to provide a more nuanced description of the three generic themes. Subcategories were developed by following the procedure of inductive thematic analysis (Braun and Clarke 2006). The hierarchical code system reflects case-specific patterns or themes within the tripartite conceptualization of inspiration (see Table 2 and Figure 1).

Coding was originally undertaken by one person and subsequently reviewed by a second. The reliability of second-cycle coding was checked on the basis of four-out-of-17 interviews that were coded independently. As an agreement of 91.8% had been achieved, which indicates the robustness of coding system and procedure, the coding was applied to the rest of the data.

Without exception, the depiction of the findings summarizes and reflects the researchers' voices, with sample quotes illustrating the essence of the themes (Elo et al. 2014).

Table 2. Coding summary.

	# of Respondents	# of Comments
<i>Inspiration</i>		
Inspiration Yes	9	21
Inspiration No	5	6
Work-relatedness Yes	1	1
Work-relatedness No	12	19
<i>Evocation</i>		
Impulse	9	13
Interruption of work routine	5	7
Different world	8	12
Artists' personality	16	66
Artwork	2	3
<i>Transcendence</i>		
Insight	10	21
Focal vision	9	12
Peripheral vision	7	15
Bifocal vision	14	35
<i>Approach motivation</i>		
Integrating ideas	6	10
Perpetuating shifts in perspective	9	18
Problem-finding	4	4
Problem-solving	6	6
Subjective judgement	5	10
Trying something new	3	7
Unconventional behavior	3	8

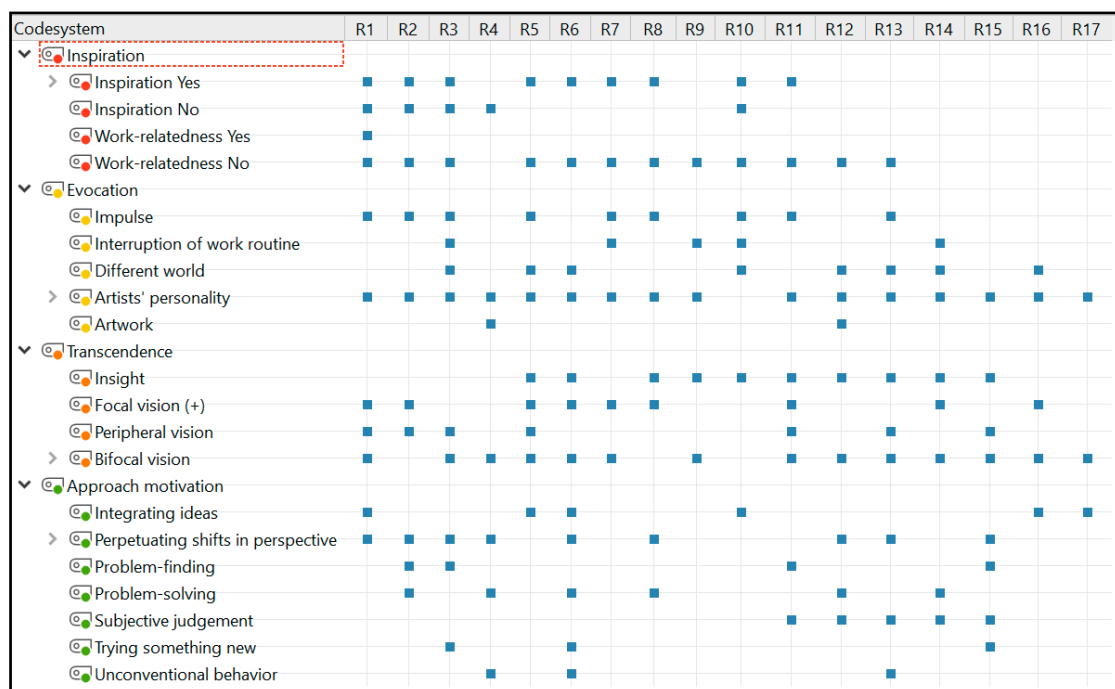


Figure 1. Summary grid.

5. Findings

Just above half of the 17 scientists and engineers interviewed for this study reported that the artists inspired them in some way. Only two of them explicitly used the term *inspiration*, whereas others spoke of *stimuli* or *suggestions*. The most frequent term referring to the construct is *impulses*, which was mentioned by eight researchers. If inspiration is realized, it is perceived as vague and subliminal in as much as researchers do not link it to specific work contents, procedures or projects. Only one of the interviewees recounted that a concrete idea occurred to him after a conversation with an artist. Three researchers explicitly acknowledge that the artists' influence will trigger ideas and contribute to their search for technical innovation. The majority deny that the encounter will have any impact on work-related inventiveness.

I learn new things, I get new impressions, I also get new creative tools, which will possibly enable me sometime to create new innovations, to realize new ideas or to recognize connections, which I have not recognized before.⁵ (R5)

But well, I cannot say now that through this I somehow became more effective by ten percent or that I got an idea for my project, where I did not have any idea at all before or so. (R1)

Nevertheless, the comments reflect the conceptual characteristics of inspiration—evocation, transcendence and approach motivation—as follows.

In the context of the artist-in-residence program, the main external stimulus for inspiration lies in the otherness that the artists personify. Researchers perceive the encounters as a stimulating, refreshing interruption of their work routine. As they relate the visiting artists to a “different” (R3, R6, R16) or “totally new world” (R5, R10, R13) and to “entirely different issues” (R10), meeting them is an interesting distraction. Accordingly, it is rarely artworks that the artists create on campus that trigger inspiration, but the artists' personality. The extent of their otherness provides a benefit beyond other interdisciplinary exchanges.

Researchers commented on both different thought and behavior patterns which distinguish the artists from themselves. They view the artists as “freethinkers” (R2) with “pretty strange ideas” (R8), who bring in different attitudes and viewpoints beyond their own experiential world and ask questions they would not have thought of.

Well, that I, so to speak, have the opportunity here to talk to people, who are in an entirely different world, who are thinking completely differently, who ask questions that nobody would ask around here. (R3)

In part, they simply take a perspective that would not occur to us at all. Well, it is just so far out of our range of experience, our experiential world and not even adjoining, that I, that of course it is certainly a benefit. (R6)

Aside from differences in lifestyle, researchers noticed differences in work behavior. As they are used to following standard procedures, they consider themselves as more structured and adventuresome and less hands-on than the artists. The artists whom they met approached issues in a way more open to experimentation.

We know okay, if we have this specific problem then the answer is this. Or if we run the numbers through this equation then this will be the result. And we follow these relatively rigid rules. I would not say it's a rigid way of thinking but maybe a more structured way of thinking. And I would say for the artists, it's more like a 'What if?' kind of process. (R12)

⁵ Exact quotes from the interviews conducted in German language were translated by the author.

As for the element of transcendence, researchers reported that they gained a lot from their dialogue with the artists and described conversations as “enriching” (R6, R9, R12, R13) on a personal level. Although researchers commented on learning experiences and insights, they neither specified this contribution to personal knowledge nor did they link it precisely to aspects of their working context. It seems difficult for them to grasp the exact nature of the impulses they received.

I take [the exchange] for, if I may say so, mind-expanding. It is good for getting new impulses. (R10)

I think, it didn't have such a concrete influence on my work but more for myself as a person. Personal impressions that I took from there. Well, just discover other perspectives, other ways of thinking. (R9)

Discussing issues with the artists or explaining technical facts to them sharpened the researchers' view on a situation and debunked errors in reasoning in the sense of enhanced focal visioning. Conversations lend things more depth or put aspects into a bigger context. As a result, researchers gained a more reflected attitude towards some subjects. In one case, engineers learned how to enhance a mechanical application because they wanted to support the artist with his challenging task.

Moreover, dealing with the artists' otherness caused researchers to reflect on issues on the edge of their perceptual field, thus improving peripheral vision in the figurative sense. For instance, in a meeting, the artist brought up marginal aspects of an issue which during the discussion had an influence both on collective idea generation and evaluation.

It broadens the mind and the view, and this is what I find totally fascinating. (R13)

Most of the mentions related to the category *transcendence* account for the subcategory *bifocal vision*, which represents shifts in perspective. The artists made researchers aware of other ways of looking at specific subject areas—among other things, by ignoring standard assessment criteria and procedures not relevant for their onsite artistic work. Researchers were introduced to other approaches to reasoning about issues they were working on and pointed to aspects they had not dealt with before, as the artists created historical or anthropological references or addressed social consequences of new technologies.

I adapt that, try to translate it into my terminology or my experiential world. . . . And the translation step I take then, usually simply leads to a new perspective in turn, to a new, maybe even to a partly new idea, new idea about implementation. (R6)

So I think this interaction with the artists usually provides a very different point of view. (R12)

Some spoke of “multiple changes of perspective” (R6) as a mode of constantly shifting from close-up to distant view and back, or betwixt different aspects of a theme.

It is a little bit like stereo vision. Suddenly you see things from a different position. And thereby, hopefully more depth emerges. And this is the enrichment. (R11)

Aesthetics are a potential way to change one's personal view. Although this kind of impulse seems obvious in collaborations with artists, only one scientist recognized possibilities in relating aesthetics to perceiving and evaluating phenomena in his own specialist discipline, whereas another experienced that an unconventional visualization of strategic issues carried out by an artist had a positive impact on team commitment.

Regarding researchers' subjective evidence of approach motivation, scientists and engineers deny that dealing with the artists on campus has changed their work behavior or research routines. There is no interview with indications on impact for that matter. The artists had no influence on specific research projects although researchers tried to transfer subjects of meetings into their own terminology and experiential world. Some were inspired to reflect upon how to relate new insights to their work context and how to integrate impulses that the artists gave them.

So I wonder: How does this relate to my work? Or: Is there anything comparable? (R10)

But by doing this work [for the artist] we didn't work out any concept for some new technology or anything like that. (R9)

I believe, it didn't have such a concrete impact on my work but rather for me as a person. (R15)

Nevertheless, there are statements that indicate that some researchers were inspired to change their behavior in more general ways. Especially through supporting artists in their creative projects, engineers gained ideas for experimental approaches within the meaning of consciously trying out something new or exploring technological feasibility. Whereas they are used to setting up experiments methodically and according to specific rules, they are willing to test things in a more playful way now.

So there comes an impulse and [the artists] take it up. And certainly, this is what we are lacking a bit just because we have this process cap on. . . . And then you certainly learn that sometimes, you simply have to check out things. (R15)

One engineer feels encouraged to act unconventionally by deviating from corporate conventions and given procedures. An example would be to forego tedious testing procedures and check the most plausible of several options with incomplete knowledge and substantial time-saving instead. Another researcher recounted that an artistic impulse motivated team members to actively participate in a strategy process.

One thing . . . is courage, the courage to be different. . . . And you can also do this in projects. You can simply put it this way: 'Now we just risk something.' . . . Full risk. Maybe it will be just an 80 percent result, but we saved three months. (R13)

For me, personally, it was very enlightening that I actually reach my folk much better if I break out of this Bosch world. Because I have their attention or because the issue has their attention. (R4)

In general, the impact of the interdisciplinary encounters with the artists is more on the researchers' mindset than on their behavior or even concrete projects.

Similar to evocation and transcendence—being inspired by different vistas and/or a shift in perspective—researchers commented intensely on changes in perspective as something which the artists inspired them to keep up. In general, as well as relating to their work, they try to step back from an issue and to inspect it from different angles. Some have become more open to encounters with artists on campus and are motivated to seek a dialogue; others were inspired to pick up suggestions from sources or thematic fields that are not directly related to their work.

I think, in general . . . the weird kind of this collaboration had an effect on this kind of taking or trying to take a step back and look at things from a different perspective. (R12)

I try to start a conversation with the artists, who are on Platform 12, more often because after all, you realized that this free thinking, if I may say so, may lead to new ideas how you can do it differently or what you can connect it with or in which direction you just could seek or look. (R8)

By asking unfamiliar questions, the artists prompted researchers to integrate formerly liminal aspects into problem-finding. As well as problem-finding, problem-solving was partly enhanced because they broke thinking patterns and provided impulses for divergent thinking.

Just looking from a slightly different angle is already enough to kind of make a step in finding a solution. (R12)

In shifting perspective, some researchers have expanded their evaluation criteria. Some tend to consider societal or ethical issues concerning new technologies. Others replace their demand for perfection by appreciating what has been already achieved.

I would say that maybe my view in evaluating those subjects or those submitted sketches or proposals has been expanded. (R11)

You do not see what is there, the whole lot that is there but the little that maybe is missing . . . And then it is about how can I turn that. . . . Maybe it is not precisely the way I imagined it but just seeing what is there. And in this, I think, I can tell this thought of confidence. (R14)

In sum, all but one interviewee delivered statements on the complete tripartite conceptualization of inspiration, including those who denied having been inspired at all. Whereas indications of evocation and transcendence are rich, manifestations of approach motivation are diffused and individual, with only a few statements and representatives in the respective subcategories, and motivation does not refer to concrete work contents including idea generation. The artistic influence rather relates to the cognitive level, with reflection, shift in perspective, divergent thinking and judgement, than inspiring action.

6. Discussion

The initial question for this research was whether the concept of inspiration is suitable to explain effects that encounters with artists-in-residence have on R&D employees. The findings corroborate the assumption that the artist residency at Bosch is a source of inspiration and therefore, by definition, the emergence of ideas (Thrash et al. 2010), since the researchers' statements reflect the three elements of the conceptualization—evocation, transcendence and approach motivation (Thrash and Elliot 2003). The findings on what exactly the researchers were inspired by and what their resulting motivation is directed towards point to a specific artist-related benefit of this interdisciplinary dialogue on the one hand. On the other hand, they illuminate limited implementation potentials relativizing the benevolent view on art–science collaborations in previous research (Schnugg 2019; Schnugg and Song 2020).

From an interactionist perspective on individual creativity, diversity in teams stimulates divergent thinking and fosters idea generation, because different perspectives collide (Woodman et al. 1993; Gilson and Litchfield 2017). Just as multicultural teamwork supports creativity and innovation (Bouncken et al. 2016; Doran and Ryan 2017), the intercultural twist which artists infuse the collaboration with (Berthoin Antal 2012) is a potential benefit. The researchers' comments correspond to research that points out personality differences between artists and scientists (Feist 1998) and differences in the creative process of these two broad professional groups (Glaveanu et al. 2013). In an R&D setting, the artist is perceived as “a kind of cultural outsider” (Lally 2011, p. 103) who personifies a “constructive disturbance” (Darsø 2016, p. 22), challenges schemata and forces individual sensemaking, which is defined as integrating experiences into an individual's understanding of the environment in order to act accordingly (Klein et al. 2006).

“Ideas impinge on consciousness from the unconscious, the preconscious, or the perceptual field” (Thrash and Elliot 2003). For the researchers at Bosch, three different dimensions of *seeing* in a wide, figurative sense emerged. In summary, evocation and transcendence can be linked to figurative notions of focal, peripheral and bifocal vision.

First, artists stimulate researchers to see *more* in the sense of looking farther, deeper or closer, so that they even may notice weak signals in their visual field (Barry and Meisiek 2010). Second, artists make them see more in the sense of dealing with environmental cues on the edges of vision, which is the area that they usually do not pay attention to (Day and Schoemaker 2004). Third, researchers are encouraged to see *differently* by taking another perspective and to move back and forth between the original and a new, possibly contrary point of view.

Individuals are shifting perspectives if they put an object into a different context by using a metaphor or an analogy (Barry and Meisiek 2010), or if they take a different angle by transcending

familiar roles and schemata (Anderson and Pichert 1978). From an anthropological perspective, bifocal seeing is a way to explore and relate to different cultures from one's own position (Peters 1997).

Changes in perception and meaning are potential sources of ideas (Drucker 1999). Whereas focal vision supports concentration on core tasks such as working on a project, and peripheral vision will sharpen perception for unexpected phenomena (Schoemaker 2019), shifts in perspective indicate individual level ambidexterity. With this skill, researchers are able to shift their focus and to reconcile possibly ambiguous attitudes and behaviors that favor the emergence of novel ideas for new product innovation (Sok and O'Cass 2015). In particular, radical innovation requires the ability to integrate knowledge from different domains despite intense professional specialization (Stüer et al. 2010a, 2010b).

In this context, it is remarkable that—with very few exceptions—researchers at Bosch did not enhance their perceptive faculties in terms of aesthetics, as suggested by other studies (Schnugg 2019). One of the artists-in-residence recounted a situation in which engineers were looking for an explanation for a small deviance in a test battery for a neural network. This took them quite a while because they were completely focused on the allegedly error-free product, whereas the artist with her well-trained eye discovered the reason in the footage right away. Besides a lack of noteworthy anecdotes on aesthetics on the part of researchers, the main trigger of inspiration is the artists and not their work. Possibly, there is not much resonance for aesthetic issues because aesthetic values in engineering differ from those in the arts (Schummer et al. 2009).

The transmission model of inspiration comprises an illuminating trigger and a target object (Thrash and Elliot 2004). In the case of Bosch researchers, the approach motivation is not instantaneously directed to a creative product but to particular ways of thinking and doing, with a considerably stronger impact on the cognitive than conative component depicted in the tripart theory of attitudes (Rosenberg and Hovland 1960). Behavioral intentions as described by the researchers themselves show similarities to the way in which artists approach their creative process: unconventional, playful, hands-on and venturesome in expanding a solution space (Jacobs 2018; Sandberg 2019). However, they are not related to the three aspects of innovative work behavior: idea generation, idea promotion and idea realization (Janssen 2000).

As ideas are the nucleus for innovation, they are considered to be the critical aspect of the front end (Roberts and Fusfeld 1981; Koen and Kohli 1998), and any improvement in the front end will have an impact on the whole innovation process (Koen et al. 2001). The fact that researchers at Bosch are inspired by artists can be equated with idea generation in general because of the conceptualization of inspiration as a result of an idea as an initial impetus (Thrash et al. 2010). However, researchers deny experiencing any concrete and conscious idea generation; at most, they see a vague influence.

This presumed contradiction arises because the ideas which the researchers conceive are not directly related to problem-solving or product development. Engineers are used to thinking in terms of demands and solutions. In this mental world, an idea is a solution to a problem (Cropley and Cropley 2005). In connection to the encounters with artists, inspiration occurs beyond a problem-solving context and without a sudden insight that enhances a person's knowledge on how to solve a problem (Oleynick et al. 2014).

The artist-in-residence program at Bosch does not have a concrete impact on research projects, because the scientists and engineers are hardly able to link the impulses to their experiential world and transfer them to fields of activity or initiatives. This may be due to the perceived level of freedom in the company's extremely structured innovation process, which works as an impeding situational factor (Oleynick et al. 2014). Another, more likely explanation may be the nature of the artist residency at Bosch. Compared to similar initiatives such as the historical *PAIR* at Xerox or *Pier 9* at Autodesk, there is not much guidance in the encounters between artists and engineers. Contacts are actively supported by innovation management but there is no systematic matching process of artistic fields of interests and research activities to begin with. Bosch is not even involved in the selection of artists. In this freewheeling situation, close cooperation is coincidental and limited to a one-way support of artistic endeavor. In this respect, the findings are not directly comparable to those on other art-science collaborations in the R&D context.

The residency program at Bosch does not directly contribute to technological innovations or its partial aspect invention, given that it does not inspire researchers to “generate or realize a new idea, based on technology, capability or knowledge” (Mentz 2006, p. 9). Despite its weak influence on R&D, the program fulfills its purpose as it is not meant to foster technological solutions but innovation culture and individual qualification to creative action (Akademie Schloss Solitude 2016). The concept is rooted in the observation that a company’s propensity to innovate depends on employees’ behaviors and skills or rather their creativity and individuality (Stüer et al. 2010b). By affecting psychological mechanisms that guide innovation, artists generate stimuli on the individual level of innovation (Ramos et al. 2016; Palazzeschi et al. 2018), but the actual impact seems to be as fuzzy as the connection between a seminal idea conceived in the front end and a completely new product.

7. Conclusions

Inspiration is one of the effects that artistic interventions may have on employees because people are “projecting and extracting meanings from a work of art or an artistic process in order to develop a meta-understanding of issues” (Schiuma 2011, p. 109). The findings at Bosch suggest that researchers who are involved in an exchange with artists experience similar reflective processes. They do so without dealing with given artworks or going through an arts-based process themselves as in artistic interventions, but by mere conversation and exchange with artists. R&D employees are experiencing the artistic mindset and the artistic process in their role as supporters and sparring partners. Similar to artistic interventions, the encounters in R&D collaborations may be “inspirational levers to prompt self-reflection and meta-understanding that can drive mindset and behavioral changes” (Schiuma 2011, p. 108).

The given study contributes to research on artists in businesses by illuminating the R&D environment as a hitherto neglected field of activity. By focusing on an artist-in-science residency in a corporate context and applying content analysis to the collected interview material, previous explorative studies on a broad range of art–science collaborations (Schnugg 2019; Schnugg and Song 2020) are refined. Deviating from optimistic propositions put forward by other researchers and practitioners, the findings suggest that the impact of interdisciplinary endeavors between artists on the one hand and scientists and engineers on the other is limited.

In the particular situation at Bosch, researchers are inspired by the artists’ otherness, transcending their usual modes of perception, and are motivated to transfer experienced shifts in perspective to future reasoning, but there are hardly any consequences for individual work-related behavior. The impact is top-heavy. Researchers are inspired to intensify divergent thinking, but these impulses do not substantially contribute to idea generation in the sense of typical front-end activities. Being inspired by artists may result in solutions for technological issues, but researchers do not integrate their insights into their work immediately.

As with any qualitative study, these findings cannot claim general validity. The discussion indicates that the lack of specific references to R&D endeavors might be a result of the residency’s design. This is a case for root cause analysis as well as systematic comparative studies on corporate artist-in-science-residencies. Likewise, the benefit that is specific for collaborations with artists should be examined more closely in order to substantiate the proposition that it outperforms other interdisciplinary arrangements.

The reasoning on positive effects of inspiration for inventiveness, innovative behavior and, in the end, the innovation process in general is hypothetical in character. Further research should address the phenomenon of inspiration through quantitative analysis, namely in art–science collaborations as well as in R&D in general. Innovative behavior resulting from interdisciplinary encounters with dimensions like idea search and idea generation could be measured (Lukes and Stephan 2017).

The study contributes to single-level innovation research. With its focus on the individual level, the collective dimension is cut out. Team and organizational level were ignored, because encounters between Bosch researchers and artists evolve randomly and the program has a limited range within

the company, as the small number of potential interlocutors for this study indicates. Nevertheless, the multi-level nature of innovation (Anderson et al. 2004) should be considered in future research on (corporate) art–science collaborations.

The findings suggest that inspiration is a suitable theoretical underpinning for the individual benefit of artist-in-science-residencies. The front end is recognized as the basis of successful innovation (Cooper and Kleinschmidt 1987) and the present study indicates that artists are able to make an informal and indirect contribution to the process by inspiring researchers regarding how to deal with its fuzziness.

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