

Art Thinking: Amplifying the 'R' in R&D

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Abstract

R&D is often, not only, the engine that powers innovation in organisations but it creates and sustains their competitive advantage. The front end of innovation—the 'R' of R&D—is expected to provide the initial spark to ignite innovation. Design thinking has become one of the most popular approaches to this crucial but challenging phase in the innovation process. In this letter, we contrast its shortcomings with a novel innovation paradigm that we derive from evidence of artistic practice: art thinking. We frame art thinking as a form of (collective) sensemaking and present its seven distinguishing features. An artistic reframing of R&D equates to a cultural shift. It requires art-based double-loop learning and needs to be championed by innovation management and supported by human resources development. We round out our plea for art thinking with seven imperatives that mark the mind shift and might serve as a call to action for corporate innovators.

Keywords: Art thinking, Design thinking, Sensemaking, R&D, Innovation, Front end of innovation, Organisational learning.

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1 Introduction

The first stage in the innovation process is called the 'front end' where pre-work is done to generate novel, original ideas and imagine new opportunities. It is described as 'fuzzy' because the opportunities under investigation are, at the outset, ill-defined and therefore lack vivid definition. The front end of innovation is characterised by a higher level of uncertainty. It is a phase that is notoriously perilous and risky as information for decision making is either unclear or absent. It is at the front end where the 'R' of R&D is located and evidence is mounting that actions taken at this R stage are a significant cause of subsequent failure in innovation projects (Magistretti et al., 2022). While the front end of innovation is considered the most important phase of the process, it remains, paradoxically, not well investigated or fully understood (Eling and Herstatt, 2017; Wagner et al, 2021). It is, therefore, vital to identify effective tools and methods to successfully manage this preliminary but crucial phase of the innovation process (Achiche et al., 2013; Marion and Fixson, 2021; Micheli et al., 2019).

Design thinking is the front end approach which has found most traction. Estimates vary between 59 % (PwC, 2017) and 75 % (Abramovich, 2017) of the number of companies currently using design thinking to facilitate their innovation endeavours. Design thinking has been lauded as a panacea (Waidelich et al., 2018) to create seductive and compelling consumer experiences. It has even been dubbed "the secret weapon for innovation" (Kelley, 2001, p. 8). In business language, *design* and *innovation* have become increasingly synonymous in both meaning and reach

(Buehring and Moore, 2018). However, design thinking has limitations, especially when it comes to radical innovation.

Whereas designers develop functional solutions for ill-structured problems (Cross, 2007; Rylander Eklund et al., 2022), artworks emerge in a mode of problem finding and inquiry (Getzels and Csikszentmihalyi, 1976). Representatives of visual art, performance art, poetry, and music explore and shape reality while not only tolerating but even provoking uncertainty and ambiguity. Artists are considered role models for imagination and innovation (Adler, 2006; Lally, 2011) because they embrace chaos and wonder as prerequisites for creation (Brater et al., 2011; Bozic and Olsson, 2013; Carabine, 2013; Medlock, 2015). Therefore, we suggest that applying the way artists think and achieve novelty to the front end of innovation offers a fresh perspective on the *R*.

In 1967, artists initiated the very first major art-science collaboration E.A.T. (Experiments in Art and Technology), an initiative which fuelled Bell Labs' R&D activities for almost 15 subsequent years. Recently, their idea of coupling domains witnessed a revival. In 2016, the European Commission launched their S+T+ARTS (Science, Technology and the Arts) program thus linking applied research to artistic practice (Friess and Dum, 2017). EU-funded projects like Artsformation and ArtIST (Art, Entrepreneurship, Innovation and Science), have demonstrated the value the arts can add to innovation management, entrepreneurial learning, and STEM education (Schnugg, 2019; O'Dea et al., 2020; Khairullina et al., 2022). Despite such initiatives, the majority of businesses stick with familiar approaches to R&D, keeping design thinking at the forefront.

In this letter, we will proceed by outlining some limitations of design thinking. We will then contrast these shortcomings with features of art thinking. Referring to organisational learning, we will present some implications on how to introduce art thinking into the front end. Finally, we provide some pointers to ignite the spark for radical ideas in R&D driven organisations.

2 Shortcomings of Design Thinking

Corporate innovators are interested in how designers work and think (Magistretti et al., 2021) and have been eager to generate a clear definition and a framework for design thinking. On the other hand, however, the design community itself, resists such oversimplification (Prud'homme van Reine, 2017). Such resistance leads to the first shortcoming: design thinking is seen as an umbrella construct and has, so far, eluded precise definition or simplifying paradigms. Several authors have even observed that, despite its popularity, the concept lacks coherent and consistent descriptions (Kimbell, 2011; Taheri et al., 2016; Micheli et al., 2019). Essentially, it is asking non-designers to think like designers and employ a design methodology when, in fact, it has been repeatedly found that designers do not typically follow methodological procedures (Badke-Schaub et al., 2005; Birkhofer et al., 2005). Some scholars, therefore, believe that design thinking is a popularised but simplistic and idealised view, formulated in low resolution where the insights are not theoretically or empirically supported but are mere generalisations (Badke-Schaub et al., 2010).

The second issue with design thinking is, paradoxically, that its obsession with the current wants and needs of customers makes it a poor predictor of future developments or of breakthrough possibilities (Norman and Verganti, 2013). It tends to deliver innovation concepts that are incremental, remain close to the current realities, and lack the imaginative leap to radical, transformational ideas (Magistretti et al., 2021). One contributor to this problem is design thinking's preference for co-creation and designing *with* rather than *for* customers (Buehring and Liedtka, 2018) a process which can lead to "wrong priorities, shallow ideas" (Panke, 2019, p. 296).

“Emphasizing the perspectives of the wrong stakeholder groups can lead a team in unproductive directions” (Gestwicki and McNely, 2012, p. 25).

A third problem is that invariably some students or practitioners of design thinking have a low tolerance for ambiguity and can find the process confusing and frustrating. “Even those practised in design thinking experience periods of frustration over the course of a project” (Glen et al., 2015, p. 189). The reason is the uncertainty inherent in the process, which can turn into anxiety as the teams gather more information, some of which is inevitably conflicting with the data they already have.

A further issue is creative overconfidence. The lack of critical feedback in design thinking workshops that is the assumption that there are ‘no bad ideas’ can lead to creative complacency (Taheri et al., 2016). Design thinking sessions generally focus on idea creation over evaluation and this can result in overconfidence without the skills and knowledge of where and how to apply the creativity (Panke, 2019).

Also of concern is the focus on *Sprint* (Knapp, 2016) rather than any longer-term perspective. Design thinking is not able to cover the span from the initial spur for change to the final implementation of results (Grots and Creuznacher, 2016). Although design thinking is firmly positioned in the front end of innovation, this criticism is more about the people using it, than the fitness for purpose of the process itself: “Design Thinkers usually lack the patience for detailed implementation of solutions” (Grots and Creuznacher, 2016, p. 192). However, this particular criticism may be a little unfair as design thinking is mainly used in the front end of innovation.

Regarding Argyris’ and Schön’s (1978) distinction between single loop (adaptive) and double loop (generative) learning, we believe that training or upskilling managers in design thinking is a manifestation of single loop learning. Single loop learning comes to the fore when goals, values, frameworks or strategies are taken for granted. It is concerned with stability and consistency; it does not question underlying thinking patterns and norms (Lewis and Moultrie, 2006). Most organisational learning is single loop learning, just as most new product development is incremental innovation (Baker and Sinkula, 1999). Because of its obsession with tools, processes and efficiency, “adaptive learning leads to incremental innovation” (Baker and Sinkula, 2007, p. 319). When an organisation concludes that it needs a boost in creativity, its response is often to initiate some design thinking. However, apparently, three decades of design thinking have not radicalised innovation.

3 Hallmarks of Art Thinking

Against this background, we introduce art thinking as a novel innovation paradigm. We derive this approach from evidence of artistic practice and frame art thinking as a form of sensemaking. Our notion of art thinking is informed by empirical studies on artistic practice, artists’ self-reports, biographical notes, and interview material on the artistic process. Following a non-empirical approach, we draw on a phenomenological understanding of artistic practice as a nexus of experiences that shows characteristic patterns (van Manen, 2014).

Our interpretation of the material is rooted in the phenomenological tradition of sensemaking, which includes a nonverbal, physical dimension (Cunliffe and Coupland, 2012; Sandberg and Tsoukas, 2020). From this perspective, sensemaking is a socially constructed process. People extract and interpret cues from their environment and try to put them into an order that allows them to understand the situation and eventually act on it (Weick, 1995). As a process of interpreting and constructing reality, art thinking has seven core characteristics: play, aesthetics, bifocality, multivalency, ambidexterity, improvisation, and embodiment.

Play

There is no rational approach to the artistic process. It is operated by experience of the moment and the “behavior” of the emerging artwork (Brater et al., 2011). The artistic process begins with an issue that is submitted to research, reflection and exploration. It takes a concrete form while the artist(s) perform incremental changes to the piece and lead a conversation with the material (Glaveanu et al., 2013; Jacobs, 2018). Unlike designers, artists do not impose their intentions on the object and they do not experiment in the sense of methodically testing predefined setups (Carabine, 2013; Medlock, 2015). Instead, the material poses questions and guides a non-linear and open-ended process (Botella et al., 2013; Carabine, 2013; Glaveanu et al., 2013). Usually, artists do not know what they are looking for until a piece is finished (Sadler-Smith and Wray, 2020). This attitude turns artful creation into an unintentional yet serious play that is led by perception (Brater et al., 2011). Consequently, art thinking stands for consciously letting go of preconceptions and mental models.

Aesthetics

Aside from creating in this mode of reflection in action (Schön, 1983), serious artists submit their emerging work to ongoing self-criticism (Bozic and Olsson, 2013; Glaveanu et al., 2013). Artists reflect their work primarily against their own aspirations but they anticipate external standards as well (Jacobs, 2018). Either way, their judgement is primarily based on aesthetics. Aesthetic judgement entails subjective notions of beauty and sensory experience. The criterion for having solved an artistic problem effectively is the artwork’s coherence. Recognizing coherence is not a matter of reason but of aesthetic knowing (Strati, 1999; Starr, 2013; Mersch, 2016). “The solution has the felt sense of clicking” (Medlock, 2015, para. 97).

Bifocality

Art thinking is characterised by an ongoing change of perspective. From an anthropological point of view, bifocal seeing is a way to explore and relate to different cultures from one’s own position (Peters, 1997). In a broader sense, it implies the ability to switch between multiple visual ranges, going from detail to holistic perception and back as well as organically moving back and forth between different positions. Bifocality includes seeing more in the sense of looking farther, deeper or closer. It enables people to notice weak signals in their visual field, which they have not perceived before (Barry and Meisiek, 2010). Bifocality is also about seeing more by dealing with cues on the edges of vision, which is the area to which people usually do not pay attention (Day and Schoemaker, 2004). A third dimension of bifocality is seeing differently by taking another perspective and switching between the original and another, possibly contrary point of view, which can be stimulated by transcending familiar roles and schemata (Anderson & Pichert, 1978).

Multivalency

In collective artistic practice, multivalency is a key feature, as different values and behaviour patterns are appreciated and balanced (Alexandre, 2017). Accordingly, art thinking not only considers one perspective—e.g., the customer point of view—but establishes a participatory process as a play with ideas and interests of different actors. In art thinking, there is no single framework under which environmental cues can be organised or interpreted. The thinking process is neither predetermined in the sense of examining a preassigned set of issues nor is it limited to selected aspects of perception (Alexandre, 2017). Thinking in right or wrong dichotomy and premature judgement are replaced by openness to experience (Walker, 2004).

Ambidexterity

“There is . . . a fundamental ‘illiteracy’ in the processes of thinking in arts” (Rajchman, 2013, p. 196) and, concurrently, a deep trust in both process, craft and experience. Hence art thinking points to the concept of ambidexterity as the dynamic ability to simultaneously explore novel and unconventional solutions and exploit proven concepts (O’Reilly and Tushman, 2008). Ambidexterity can also be understood as a combination of different learning processes. While the so-called ‘exploit’ mode focuses on feedback learning from experience, the ‘explore’ mode aims at feed-forward learning that is less about the past and more about an orientation to possible futures and adopting a beginner’s mind (Bucic et al., 2010). Art thinking means challenging the status quo while exploiting previous experience. It entails an interplay between building on precedents on the one hand and questioning them on the other (Alexandre, 2017).

Improvisation

Actors, dancers and musicians use improvisation as a performing practice but also as a form of inquiry. While exploring an issue, they generate a body of material that may serve as a starting point for creating a piece. After all, improvisation is a collaborative practice of expanding on the solution space without anticipation or prejudice. In this process, interpretation and spontaneous creation are intertwined and retrospection is instantaneously followed by action. Therefore, improvisation is a manifestation of sensemaking (Weick, 1998). Improvisation requires a ‘yes, and’ mindset that is basically open for any impulse to be accepted and enhanced. Although it builds on expertise and a framework, improvisation evolves from being present in the moment, and intuitively responding to collaborators instead of following a plan (Vera and Crossan, 2005).

Embodiment

Regarding the interplay between eye, hand and mind during drawing and other forms of embodied thinking (Pallasmaa, 2009), the artistic act of creation has been described as a mode “in which one ‘thinks with one’s body,’ not just with one’s brain or mind” (Rajchman, 2013, p. 198). The sensemaking process in artful creation has an embodied character that extends beyond cognitive information processing. It involves feelings, bodily sensations and sensory knowing (Cunliffe and Coupland, 2012). Artworks are the result of discovering and making meaning, which is not only captured in language (Dewey, 1934). The concept of art thinking is based on the human body as a knowing entity and recognises “perception, sensations and feelings as sources and forms of bodily knowledge” (Hämäläinen, 2007, p. 56). In a nutshell, the process of problem formulation and resolution is fueled by aesthetic experience.

4 Reframing R&D through Art Thinking

Designers rely on abductive reasoning and tend to copy proven gambits. Design solutions often unfold in a logical sequence (Cross, 2007; Rylander Eklund et al., 2022). The artistic process, however, defies logic, repeatable patterns, and predetermined order (Lehnerer, 1994). It is a form of creative emergence (Medlock, 2015). While the design thinking approach accentuates problem solving with empathy, abductive reasoning, and experimentation (Rylander Eklund et al., 2022), art thinking emphasises problem finding through aesthetics, creative emergence, and play.

Design thinking is, essentially, a framework and a set of tools or practices (Robbins and Fu, 2022) and thus relatively easy to introduce. For organisations who want to extend to the next level, introducing art thinking into R&D will be a far more complex undertaking as it does not lend itself to being reduced to a set of tools and templates. In fact, art thinking encourages experiencing and

perceiving situations through bodily sensations and feelings so as to sense meaning. Embracing this attitude requires double loop learning and a cultural shift for organisations who engage with it.

Double loop learning occurs when problems are identified and solved in ways that involve the modification of an organisation's underlying norms, policies and objectives (Sadler-Smith et al., 2001). Double loop learning questions the fundamental assumptions of an organisation. There is a high degree of consistency between double loop learning's capacity to ask fundamental questions, to learn new things and make systemic changes, and an organisation's conversion to art thinking, which thrives by expanding the perceptual field and breaking existing organisational routines. The diffusion of the art thinking mindset within organisations will require both innovation management and human resources to champion and support it.

As for innovation management, businesses already see the benefits of engaging with the arts. Art-science collaborations often take the form of artist-in-residence programs (McDermott and Fieseler, 2021). Most examples for collaborations between R&D and artists occur in the development stage, when members of creative industries receive grants and are invited to join hubs, labs, panels or teams for open innovation as with Google, Meta, and Adobe. A handful of companies such as Xerox, Intel, Autodesk, Nokia Bell Labs, Vodafone, Microsoft, and Bosch pioneered and embedded artists into their R&D organisations (Sandberg, 2020). However, most of these programs had a limited scope and a short half-life. Their demise shows that art thinking requires both individual rethinking and a shift in innovation culture.

One prerequisite of art thinking is making scientists understand that meaning is not linguistically limited to concepts and propositions but has an embodied dimension, which can be accessed by perception and movement (Dewey, 1934; Johnson, 2018). Following this line of thought, we suggest including art-based interventions into R&D's professional development curriculum to nurture tacit perception and somatic consciousness. By cultivating conversations with artists, reflecting on artworks and diving into artistic activities themselves, non-artists may develop an understanding of how artists innovate (Robbins, 2018; Sandberg, 2019).

We believe that encounters at the intersection of knowledge domains will spark creativity (Johansson, 2004) and help scientists and engineers overcome linear, incrementally oriented patterns of invention.

5 Conclusion

Design is increasingly being positioned as an organizational competence that promises a route to sustained competitive advantage and not simply one-off innovation outputs (Buehring and Liedtka, 2018). Design thinking has been heralded as a panacea but has not yet proven to be one (Björklund et al, 2020). By framing innovation as the ultimate form of organisational learning (Wang and Ahmed, 2003), we can position organisations' infatuation for design thinking as adaptive or single loop learning because it solves a problem in terms of generating potential future pipeline ideas for the organisation but it does so without fundamentally changing the organisation or questioning its structure or business model. Design thinking is detectable through office layout and design (Seifried and Wasserbaech, 2019). Design thinking outputs are generally more incremental than radical.

Art thinking, by contrast, requires a fundamental shift both in terms of culture and mindset. As a form of (collective) sensemaking, it demands an organisational commitment that extends beyond the adoption of new templates and practices. In this way, we see a desirable dissemination

of art thinking as generative or double loop learning that requires a deep dive into the artistic mindset through art-based learning and art-science collaboration.

In the front end of the innovation process, radical ideas offer the potential for successful disruptive innovation and the possibility of new and uncontested market opportunities by either transforming existing markets or creating new ones (Leifer et al., 2000). Incremental innovation, on the other hand, offers only the opportunity to marginally move the dial on market position and share. For organisations who want to advance in the direction of more transformational innovation, we propose they begin to integrate art thinking in their innovation process. To do so, we suggest they start by making the following changes, which reflect the seven hallmarks of art thinking as presented above:

1. Make your process more playful!
2. Make it beautiful—open your senses and prioritise aesthetics in your process!
3. Change your point of view! Look at an issue from different levels of analysis or through the eyes of another discipline.
4. Engage multiple stakeholders to encourage multivalency!
5. Acknowledge the need to balance the precision of operational excellence when you execute and the chaos of art thinking as you innovate.
6. Bend the rules with a beginner's mind! Be susceptible to whatever comes up and respond to the moment.
7. Think with your body!

6 References

- Abramovich, G. (2017, August 8). 15 mind-blowing stats about design thinking. *Adobe Experience Cloud Blog*. <https://business.adobe.com/blog/the-latest/15-mind-blowing-stats-about-design-led-businesses>
- Achiche, S., Appio, F. P., McAloone, T. C., & Di Minin, A. (2013). Fuzzy decision support for tools selection in the core front end activities of new product development. *Research in Engineering Design*, 24(1), 1–18. <https://doi.org/10.1007/s00163-012-0130-4>
- Adler, N. J. (2006). The arts & leadership: Now that we can do anything, what will we do? *Academy of Management Leadership & Education*, 5(4), 486–499. <https://doi.org/10.5465/amle.2006.23473209>
- Alexandre, J. M. (2017). *Dance leadership: Theory into practice*. London, GB: Palgrave Macmillan.
- Anderson, R. C., & Pichert, J. W. (1978). Recall of previously unrecallable information following a shift in perspective. *Journal of Verbal Learning and Verbal Behavior*, 17(1), 1–12. [https://doi.org/10.1016/S0022-5371\(78\)90485-1](https://doi.org/10.1016/S0022-5371(78)90485-1)
- Argyris, C., & Schön, D. (1978). *Organizational learning: A theory of action perspective*. Reading, MA: Addison-Wesley.
- Badke-Schaub, P., Lloyd, P., van der Lugt, R., & Roozenburg, N. (2005). Human-centered design methodology. In H. Achten, K. Dorst, P. J. Stappers, & B. de Vries (Eds.), *Design research in the Netherlands 2005: Proceedings of the symposium held on 19-20 May* (pp. 23–31). Eindhoven, NL: Eindhoven University of Technology.

- Badke-Schaub, P., Roozenburg, N., & Cardoso, C. (2010). Design thinking: A paradigm on its way from dilution to meaninglessness. In K. Dorst, S. Stewart, I. Staudinger, B. Paton, & A. Dong (Eds.), *Proceedings of the 8th Design Thinking Research Symposium (DTRS8)* (pp. 39–49). Sydney, AU: DAB documents.
- Baker, W. E., & Sinkula, J. M. (1999). The synergistic effect of market orientation and learning orientation on organizational performance. *Journal of the Academy of Marketing Science*, 27(4), 411–427. <https://doi.org/10.1177/0092070399274002>
- Baker, W. E., & Sinkula, J. M. (2007). Does market orientation facilitate balanced innovation programs? An organizational learning perspective. *Journal of Product Innovation Management*, 24(4), 316–334. <https://doi.org/10.1111/j.1540-5885.2007.00>
- Barry, D., & Meisiek, S. (2010). Seeing more and seeing differently: Sensemaking, mindfulness, and the workarts. *Organization Studies*, 31(11), 1505–1530. <https://doi.org/10.1177/01708406>
- Bellis, P., & Verganti, R. (2020). Pairs as pivots of innovation: How collaborative sensemaking benefits from innovating in twos. *Innovation*, 23(3), 375–399. <https://doi.org/10.1080/14479338>
- Birkhofer, H., Jansch, J., & Kloberdanz, H. (2005). An extensive and detailed view of the application of design methods and methodology in industry. In A. Samuel & W. Lewis, *Proceedings of the 15th International Conference on Engineering Design* (no. DS35_188.49). Barton, AU: Engineers Australia.
- Björklund, T., Maula, H., Soule, S. A., & Maula, J. (2020). Integrating design into organizations: The coevolution of design capabilities. *California Management Review*, 62(2), 100–124. <https://doi.org/10.1177/0008125619898245>
- Botella, M., Glaveanu, V., Zenasni, F., Storme, M., Myszkowski, N. et al. (2013). How artists create: Creative process multivariate factors. *Learning and Individual Differences*, 26, 161–170. <https://doi.org/10.1016/j.lindif.2013.02.008>
- Bozic, N., & Olsson, B. K. (2013). Culture for radical innovation: What can business learn from creative processes of contemporary dancers? *Organizational Aesthetics*, 2(1), 59–83. <https://oa.journals.publicknowledgeproject.org/index.php/oa/artic>
- Brater, M., Freygarten, S., Rahmann, E., & Rainer, M. (2011). *Kunst als Handeln – Handeln als Kunst: Was die Arbeitswelt und Berufsbildung von Künstlern lernen können* [Art as action – action as art: What the world of work and vocational training can learn from artists]. Bielefeld, DE: W. Bertelsmann.
- Bucic, T., Robinson, L., & Ramburuth, P. (2010). Effects of leadership style on team learning. *Journal of Workplace Learning*, 22(4), 228–248. <https://doi.org/10.1108/13665621011040680>
- Buehring, J. H., & Liedtka, J. (2018). Embracing systematic futures thinking at the intersection of strategic planning, foresight and design. *Journal of Innovation Management*, 6(3), 134–152. https://doi.org/10.24840/2183-0606_006-003_0006
- Buehring, J. H., & Moore, P. (2018). Emotional and social intelligence as ‘magic key’ in innovation: A designer’s call toward inclusivity for all. *Journal of Innovation Management*, 6(2), 6–12. https://doi.org/10.24840/2183-0606_006.002_0002
- Carabine, J. (2013). Creativity, art and learning: A psycho-social exploration of uncertainty. *International Journal of Art & Design Education*, 32(1), 33–43. <https://doi.org/10.1111/j.1476-8070.2013.01745.x>

- Cornelissen, J., & Schildt, H. (2015). Sensemaking in strategy as practice: A phenomenon or a perspective? In D. Golsorkhi, L. Rouleau, D. Seidl, & E. Vaara (Eds.), *Cambridge handbook of strategy as practice* (2nd ed., pp. 345–364). Cambridge: Cambridge University Press. <https://doi.org/10.1017/0018726711424321>
- Cross, N. (2007). From a design science to a design discipline: Understanding designerly ways of knowing and thinking. In R. Michel (Ed.), *Design research now: Essays and selected projects* (pp. 41–54). Basel, CH: Birkhäuser. https://doi.org/10.1007/978-3-7643-8472-2_3
- Cunliffe, A., & Coupland, C. (2012). From hero to villain to hero: Making experience sensible through embodied narrative sensemaking. *Human Relations*, 65(1), 63–88. <https://doi.org/10.1177/0018726711424321>
- Day, G. S., & Schoemaker, P. J. H. (2004). Driving through the fog: Managing at the edge. *Long Range Planning*, 37(2), 127–42. <https://doi.org/10.1016/j.lrp.2004.01.004>
- Dewey, J. (1934). *Art as experience*. New York, NY: Capricorn.
- Dougherty, D., Borrelli, L., Munir, K., & O'Sullivan, A. (2000). Systems of organizational sensemaking for sustained product innovation. *Journal of Engineering and Technology Management*, 17(3), 321–355. [https://doi.org/10.1016/S0923-4748\(00\)00028-X](https://doi.org/10.1016/S0923-4748(00)00028-X)
- Eling, K., & Herstatt, C. (2017). Managing the front end of innovation: Less fuzzy, yet still not fully understood. *Journal of Product Innovation Management*, 34(6), 864–874. <https://doi.org/10.1111/jpim.12415>
- Friess, P., & Dum, R. (2017). STARTS: Why not using the arts for better stimulating internet of things innovation. In O. Vermesan & J. Bacquet (Eds.), *Cognitive hyperconnected digital transformation: Internet of things intelligence evolution* (pp. 157–166). Gistrup, DK: River. <https://doi.org/10.1201/9781003337584>
- Gestwicki, P. McNely, B. (2012) A case study of a five-step design thinking process in educational museum game design. *Meaningful Play 2012 Conference Proceedings*. https://meaningfulplay.msu.edu/proceedings2012/mp2012_submission_37.pdf
- Getzels, J. W., & Csikszentmihalyi, M. (1976). *The creative vision: A longitudinal study of problem finding in art*. New York, NY: John Wiley & Sons.
- Glaveanu, V., Lubart, T., Bonnardel, N., Botella, M., de Biais, P.-M. et al. (2013). Creativity as action: Findings from five creative domains. *Frontiers in Psychology*, 4, Article 176. <https://doi.org/10.3389/fpsyg.2013.00176>
- Glen, R., Suci, C., & Baughn, C. (2014). The need for design thinking in business schools. *Academy of Management Learning & Education*, 13(4), 653–667. <https://doi.org/10.5465/amle.2012.0308>
- Grots, A., & Creuznacher, I. (2016). Design thinking: process or culture? In W. Brenner & F. Uebernickel (Eds.), *Design thinking for innovation* (pp. 183–191). Cham, CH: Springer. https://doi.org/10.1007/978-3-319-26100-3_13
- Hämäläinen, S. (2007). The meaning of bodily knowledge in a creative dance-making process. In L. Rouhiainen (Ed.), *Ways of knowing in dance and art* (pp. 56–78). Helsinki, FI: Theatre Academy.
- Jacobs, J. (2018). Intersections in Design Thinking and Art Thinking: Towards interdisciplinary innovation. *Creativity*, 5(1), 4–25. <https://doi.org/10.1515/ctra-2018-0001>

- Jay, J. (2013). Navigating paradox as a mechanism of change and innovation in hybrid organizations. *Academy of Management Journal*, 56(1), 137–159. <https://doi.org/10.5465/amj.2010.0772>
- Johansson, F. (2004). *The Medici effect: Breakthrough insights at the intersection of ideas, concepts, and cultures*. Boston, MA: Harvard Business School.
- Johnson, M. (2018). *The aesthetics of meaning and thought: The bodily roots of philosophy, science, morality, and art*. Chicago, IL: University of Chicago Press.
- Kelley, T. (2001). *The art of innovation*. New York, NY: Harper Collins Business.
- Khairullina, I., Podmetina, D., & Albats, E. (2022). Art-based innovation teaching and learning: How do students, teachers, and administrators experience STEAM education online? In L. Chechurin (Ed.), *Digital teaching and learning in higher education* (pp. 247–295). Cham, CH: Palgrave Macmillan. https://doi.org/10.1007/978-3-031-00801-6_13
- Kimbell, L. (2011). Rethinking design thinking: Part I. *Design and Culture*, 3(3), 285–306. <https://doi.org/10.2752/175470811X13071166525216>
- Lally, E. (2011). Practising innovation: The power of the artist. In E. Lally, I. Ang, & K. Anderson (Eds.), *The art of engagement: Culture, collaboration, innovation* (pp. 99–117). Crawley, AU: University of Western Australia.
- Lehnerer, T. (1994). *Methode der Kunst [Method of the art]*. Würzburg, DE: Königshausen & Neumann.
- Leifer, R., McDermott, C. M., Colarelli O'Connor, G., Peters, L. S., Rice, M. P., & Veryzer, R. W. (2000). *Radical innovation: How mature companies can outsmart upstarts*. Boston, MA: Harvard Business School.
- Magistretti, S., Ardito, L., & Messeni Petruzzelli, A. (2021). Framing the microfoundations of design thinking as a dynamic capability for innovation: Reconciling theory and practice. *Journal of Product Innovation Management*, 38(6), 645–667. <https://doi.org/10.1111/jpim.12586>
- Magistretti, S., Dell'Era, C., Verganti, R., & Bianchi, M. (2022). The contribution of design thinking to the R of R&D in technological innovation. *R&D Management*, 52(1), 108–125. <https://doi.org/10.1111/radm.12478>
- McDermott, F., & Fieseler, C. (2021). *Mapping of arts integration within enterprise*. Artsformation Report Series. <https://dx.doi.org/10.2139/ssrn.38616>
- Marion, T. J., & Fixson, S. K. (2021). The transformation of the innovation process: How digital tools are changing work, collaboration, and organizations in new product development. *Journal of Product Innovation Management*, 38(1), 192–215. <https://doi.org/10.1111/jpim.12547>
- Medlock, G. (2015). The San Miguel artist project: A grounded theory of “the emergence of wonder”. *Forum: Qualitative Social Research*, 16(2), Article 5. <https://doi.org/10.17169/fqs-16.2.2243>
- Mersch, D. (2016). Aesthetic difference: On the “wisdom” of the arts. In I. Hediger & J. Scott, *Artists-in-labs: Recomposing art and science* (pp. 235–250). Berlin, DE: De Gruyter.
- Micheli, P., Wilner, S. J. S., Bhatti, S. H., Mura, M., & Beverland, M. B. (2019). Doing design thinking: Conceptual review, synthesis, and research agenda. *Journal of Product Innovation Management*, 36(2), 124–148. <https://doi.org/10.1111/jpim.12466>

- Moultrie, J., Nilsson, M., Dissel, M., Haner, U.-E., Janssen, S., & Van der Lugt, R. (2007). Innovation spaces: Towards a framework for understanding the role of the physical environment in innovation. *Creativity and Innovation Management*, 16(1), 53–65. <https://doi.org/10.1111/j.1467-8691.2007.00419.x>
- Nakata, C., & Hwang, J. (2020). Design thinking for innovation: Composition, consequence, and contingency. *Journal of Business Research*, 118, 117–128. <https://doi.org/10.1016/j.jbusres.2020.06.038>
- Norman, D. A., & Verganti, R. (2014). Incremental and radical innovation: Design research vs. technology and meaning change. *Design Issues*, 30(1), 78–96. https://doi.org/10.1162/DESI_a_00250
- O'Dea, T., Alacovska, A., & Fieseler, C. (2020). *The role of art in enterprise*. Artsformation Report Series. <https://dx.doi.org/10.2139/ssrn.3716274>
- O'Reilly, C. A., & Tushman, M. L. (2008). Ambidexterity as a dynamic capability: Resolving the innovator's dilemma. *Research in Organizational Behavior*, 28, 185–206. <https://doi.org/10.1016/j.riob.2008.06.002>
- Pallasmaa, J. (2009). *The thinking hand: Existential and embodied wisdom in architecture*. Chichester, GB: John Wiley & Sons.
- Panke, S. (2019). Design thinking in education: Perspectives, opportunities and challenges. *Open Education Studies*, 1(1), 281–306. <https://doi.org/10.1515/edu-2019-0022>
- Peters, J. D. (1997). Seeing bifocally: Media, place, and culture. In A. Gupta & J. Ferguson (Eds.), *Culture, place, and power: Essays in critical anthropology* (pp. 75–92). Durham, NC: Duke University Press.
- Prud'homme van Reine, P. (2017). The culture of design thinking for innovation. *Journal of Innovation Management*, 5(2), 56–80. https://doi.org/10.24840/2183-0606_005.002_0006
- PwC. (2017). *Reinventing innovation: Five findings to guide strategy through execution* [White paper]. New York, NY: PwC. <https://www.pwc.com/us/en/advisory-services/business-innovation/assets/2017-innovation-benchmark-findings.pdf>
- Rajchman, J. (2013). Art as a thinking process: New reflections. In M. Ambrožič, & A. Vettese (Eds.), *Art as a thinking process: Visual forms of knowledge production* (pp. 194–204). Berlin, DE: Sternberg Press.
- Robbins, P. (2018). From design thinking to art thinking with an open innovation perspective: A case study of how art thinking rescued a cultural institution in Dublin. *Journal of Open Innovation: Technology, Market, and Complexity*, 4(4), Article 57. <http://dx.doi.org/10.3390/joitmc4040057>
- Robbins, P., & Fu, N. (2022). Blind faith or hard evidence? Exploring the indirect performance impact of design thinking practices in R&D. *R&D Management*, 52(4), 704–719. <https://doi.org/10.1111/radm.12515>
- Rylander Eklund, A., Navarro Aguiar, U., & Amacker, A. (2022). Design thinking as sensemaking: Developing a pragmatist theory of practice to (re)introduce sensibility. *Journal of Product Innovation Management*, 39, 24–43. <https://doi.org/10.1111/jpim.12604>
- Sadler-Smith, E., Spicer, D. P., & Chaston, I. (2001). Learning orientations and growth in smaller firms. *Long Range Planning*, 34(2), 139–158. [https://doi.org/10.1016/S0024-6301\(01\)00020-6](https://doi.org/10.1016/S0024-6301(01)00020-6)

- Sadler-Smith, E., & Wray, T. (2020). Abductive reasoning, creativity and the logic of intuition. In V. Dörfler & M. Stierand (Eds.), *Handbook of research methods on creativity* (pp.111–125). Cheltenham, GB: Edward Elgar. <https://doi.org/10.4337/9781786439659.00015>
- Sandberg, B. (2019). Art Hacking for business innovation: An exploratory case study on applied artistic strategies. *Journal of Open Innovation: Technology, Market, and Complexity*, 5(1), Article 20. <https://doi.org/10.3390/joitmc5010020>
- Sandberg, B. (2020). The artist as innovation muse: Findings from a residence program in the fuzzy front end. *Administrative Sciences*, 10(4), Article 88. <https://doi.org/10.3390/admsci10040088>
- Sandberg, J., & Tsoukas, H. (2020). Sensemaking reconsidered: Towards a broader understanding through phenomenology. *Organization Theory*, 1(1). <https://doi.org/10.1177/2631787719879937>
- Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York, NY: Basic Books.
- Schnugg, C. (2019). *Creating artscience collaboration: Bringing value to organizations*. Cham, CH: Palgrave Macmillan.
- Seifried, J., & S. Wasserbaech, C. (2019). Design thinking in leading European companies: Organizational and spatial issues. *Journal of Innovation Management*, 7(1), 80–107. https://doi.org/10.24840/2183-0606_007.001_0006
- Starr, G. (2013). *Feeling beauty: The neuroscience of aesthetic experience*. Cambridge, MA: MIT Press.
- Strati, A. (1999). *Organization and aesthetics*. London, GB: Sage.
- Taheri, M., Unterholzer, T., & Meinel, C. (2016). Design thinking at scale: A report on best practices of online courses. In H. Plattner, C. Meinel, & L. Leifer (Eds.), *Design thinking research* (pp. 217–235). Cham, CH: Springer. https://doi.org/10.1007/978-3-319-40382-3_13
- van Manen, M. (2014). *Phenomenology of practice: Meaning-giving methods in phenomenological research and writing*. New York, NY: Routledge.
- Vera, D., & Crossan, M. (2005). Improvisation and innovative performance in teams. *Organization Science*, 16(3), 203–224. <https://doi.org/10.1287/orsc.1050.0126>
- Wagner, S., Bican, P. M., & Brem, A. (2021). Critical success factors in the front end of innovation: Results from an empirical study. *International Journal of Innovation Management*, 25(4), Article 2150046. <https://doi.org/10.1142/S1363919621500468>
- Waidelich, L., Richter, A., Koelmel, B., & Bulander, R. (2018). Design thinking process model review. *2018 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)* (pp. 1–9). <https://doi.org/10.1109/ICE.2018.8436281>
- Walker, S. (2004). Understanding the artmaking process: Reflective practice. *Art Education*, 57(3), 6–12. <https://doi.org/10.1080/00043125.2004.11653545>
- Wang, C. L., & Ahmed, P. K. (2003). Organisational learning: A critical review. *The Learning Organization*, 10(1), 8–17. <https://doi.org/10.1108/09696470310457469>
- Weick, K. E. (1995). *Sensemaking in organizations*. Thousand Oaks, CA: Sage.
- Weick, K. E. (1998). Introductory essay: Improvisation as a mindset for organizational Analysis. *Organization Science*, 9(5), 543–555. <https://www.jstor.org/stable/2640292>

Biographies



Peter Robbins. Peter Robbins is one of Ireland's foremost experts in innovation and new product and service development. He was global head of innovation excellence for GlaxoSmithKline where he led many of the worldwide, new product launches for Lucozade, Aquafresh, Sensodyne, Panadol, Ribena, alli and NiQuitin. Peter's PhD is in Innovation. His area of research is how firms organise for innovation. He is a former head of the Department of Design Innovation in Maynooth University. He is a member of the Government's National Design Forum and has developed and run courses and workshops in innovation for organisations in the public and private sector. He is on a number of innovation advisory boards in business and the third sector. Peter has trained in the renowned Stanford D School, he is a graduate of London's What-if creativity programme. He has published in R&D Management, the Irish Journal of Management: International Journal of Innovation Management; London Strategy Review and regularly speaks at international conferences on the subject of managing creativity and innovation.



Berit Sandberg. Berit Sandberg is Professor of business administration at the University of Applied Sciences Berlin, HTW Berlin Business School, Germany. She has a degree in business administration from the University of Göttingen, Germany, where she completed her doctorate and was awarded her habilitation as well. During the last decade, intersections between business administration and the arts have been Berit's main research interest. She managed extensive research projects on artistic work attitudes and art-based skills development, developed concepts for art-based learning and founded the label Art Hacking® for an art-based innovation method. Her track record includes papers on the artistic mindset, art-based leadership development, and the transfer of artistic strategies to entrepreneurship and business innovation.