

Connecting the (Distant) Dots: From Design to Automated Foresight, through Design Futures

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Abstract: This reflexive essay critically examines the emergent confluence of generative artificial intelligence (Gen-AI) and Design Futures through a multidisciplinary, year-long practice engaging strategic foresight and Design Research methodologies. The authors explore how Gen-AI could reshape traditional design futures practices. The authors situate these developments within historical and cultural contexts, highlighting the pervasive cultural lag in AI adoption and contrasting techno-optimist and techno-pessimist narratives. The essay foregrounds the ambivalent reception of AI in design-related foresight discourse. Their study advances a hybrid methodology that integrates human critical judgment (“Trained Judgement”) with automated foresight outputs, emphasizing the dialectical transformation of AI-generated “hallucinations” into “hypercreative” signals that enrich futures thinking beyond traditional methods. Ultimately, the essay posits that rather than supplanting human ingenuity, Gen-AI serves as a provocative tool for expanding foresight, creativity, and methodological rigor, underscoring the continuing indispensability of human agency in navigating complex, uncertain futures.

Practical Implications: The authors present a reflexive essay based on a year-long multidisciplinary practice about how Gen-AI came to generate new directions in Design Futures and beyond. At the practical implementation level, the study pragmatically advises industry stakeholders to adopt these insights for eco-conscious and inclusive strategic planning.

Keywords: Design Futures; Automated Foresight; Strategic Design; Mixed Methods; Reflexive Practices.

1. Introduction

While strategic foresight has been proposed as a path forward through the identified barriers to business model innovation (Moqaddamerad & Ali, 2024), organizations also encounter other barriers to adopting foresight “such as organizational culture, lack of experience, mental models, measurability and clarity on investment” (Mortensen et al., 2021). The authors contend that generative artificial intelligence (Gen-AI) can provide one path through these barriers and are currently on a journey to illustrate how.

Over the past few years, the authors have collaborated to establish a theoretical foundation for utilizing automation



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tools in strategic foresight. Much of this foundation appeared obvious to the authors. For example, in a foresight workshop context, artificial intelligence (AI) can be used to reduce the time needed to work through some steps, such as environmental scanning, system mapping, and scenario development. Environmental scanning can be conducted, systems can be mapped, and scenarios can be automatically generated during the workshop in a matter of minutes. Because the time is reduced, AI can support facilitators to expand their workshops. Likewise, AI can handle much of the analytical aspect of workshops during the workshop to keep the participation time busy with knowledge creation (Dufva & Ahlqvist, 2015).

However, validating these assumptions with existing research has proven difficult, and even researching the topic sufficiently for an academic setting has been harder than expected. Part of the reason for the slow progress is due to public perceptions of AI.

2. Historical Context for AI Public Perceptions

Since the public release of ChatGPT 3.5 in 2022, public discussions about the possibility of technological unemployment (Keynes, 1930) have resurfaced with few differences from the same discussions nearly one hundred years ago (Rotman, 2024). While robots continue to replace humans in the manufacturing sector, there is evidence that the overall impact of robots and AI on individuals may be a net positive, considering rebounding local wages (Chung, 2023). Likewise, Generative AI could play a role in enhancing the manufacturing sector's human workforce (Kernan et al., 2023). Concerns of technological unemployment may therefore be premature since technological unemployment is less about technological capabilities and more about the organizational pursuit of maximum profits (Ebert, 2023). The effects on white-collar jobs, while potentially devastating, might be tempered by a change in the narrative about AI to focus CEOs on using AI to enhance human work rather than replacing it. In short, Gen-AI might be conceptualized as an asset to humans, in both economic and employment opportunity viewpoints, despite pessimistic narratives. In this debate, this paper proposes an engagement within an appreciative exploration of opportunities.

3. Cultural Lag of Generative AI

In 1922, William F. Ogburn advanced the idea that people adjust more slowly than material culture (Ogburn, 1966). Further study on cultural lag indicates that some people within a culture adopt change rapidly while others resist change (Fisher & Wright, 2001). Techno-optimists seek rapid change and focus on the separation of humanity further from nature to become one with machines in hopes of putting an end to human death (Gordijn & Chadwick, 2008; Wernaart, 2022). However, in doing so, humanity would surrender agency to machines that have no agency independent of humanity (Diéguez & García-Barranquero, 2024). Some groups of techno-optimists can be considered antihuman (Sagikzy & Uyzbayeva, 2024). On the other hand, techno-pessimists overemphasize the negative effects of AI (Tunç & Öcal, 2023; Wernaart, 2022). Yet, between these extremes is a moderate group of people who call for more responsible uses of digital technologies (Rauch, 2019).

AI-enabled technologies are often associated with anthropomorphic metaphors (Li & Suh, 2021) to encourage humans to accept them more readily (Li & Sung 2021). Adopting these anthropomorphic metaphors illustrates the theory of cultural lag currently at work with Generative AI. Both techno-optimists and techno-pessimists speak of AI as if it held an agency to act independently from society (Govia, 2018). While Artificial General Intelligence (AGI) is often personified with human characteristics such as artificial suffering (Li, 2025), LLMs are tools and are not a replacement for human intelligence (Xu et al., 2023).

Noted futurist, Jim Dator wrote an editorial about the integration of foresight with AI before the release of ChatGPT 3.5. There, he quoted David Miller as saying, "Artificial intelligence is whatever machines can't do yet". By this, Dator explains that what machines eventually do will become commonplace, and then, the term artificial intelligence will be applied to some other emerging technology (2020). However, even Dator heralds the achievements of ChatGPT and proclaims that AI is no longer some aspect of science fiction but is now permanently embedded into society. He also comments on the increased negative backlash from AI-experts and non-experts alike (2024). With these two papers, Dator is both illustrating and commenting on the cultural lag of Generative AI.

Since many of their colleagues seemed torn between two extremes over AI, the authors began to focus more specifically on design futures. The design industry has been disrupted by plain language image generation, and they are more open to using AI in a human-active manner that respects both human dignity and technology.

4. Design and the future: a never-ending story

Intrinsically, design has always been about the future because the work of designers is nothing but a projection of how our material and sensorial world will look and feel (Flusser, 1999), according to a given political ideology (Fry, 2011). From this perspective, the ultimate meaning of design itself might be captured in the synthesis of the human agency that organizes energy flows, be it heat, light, or those ideas which trigger and inspire social innovation in the form of manifestos (Bevolo, 2009) or constitutions as the foundation of states (Grubin, 2010).

The power of design unfolds at different levels within different timelines and scopes, or Innovation Horizons (Kyffin & Gardien, 2009), from strategically innovating at Horizon 3, to progressing linearly to next-generation products by adapting aesthetics at Horizon 1. At this less visionary level, designers are the professionals who envision, sketch, and materialize the next generations of products, applications, and services, while at Horizon 2 designers invent the next category of solutions and propositions by combining their talents, in the form of “Trained Judgement” (Berkel, 1999), with their understanding and interpretation of technologies, trends, and taste, within a given culture and industry.

Such understanding has been increasingly augmented, in history, from individual genius to collective, participatory processes of multicultural, multidisciplinary analysis of socio-cultural developments (Pisano & Verganti, 2008), reaching unprecedented levels of excellence within “Design Districts”, e.g. since the 1950’s the Lombardy district of furniture or until the 2010’s, the Turin district of automotive design, both in Italy. Since the 1990’s, the vivid and organic nature of Design Districts, with thought leaders, trendsetters, industrialists, investors, and designers organically partaking in the conception process of “the new”, inspire innovative approaches to industrial design management (Marzano, 1999) through the creation of concepts, prototypes and scenarios, envisioning the future (Marzano, 2005).

4.1. Design: The Cultural Turn, from Planning to Foresight

Designers and design grew in business relevance from the 1980s (Casciani & Di Pietrantonio, 1991) through the 2010s, building upon the great foundation provided by 1900s schools like Bauhaus in pre-Nazi Germany and the great vernacular tradition of national styles and approaches, e.g., Italian design (Branzi, 1999). With the digital revolution that started from desktop computing in the 1980s, designers and design were capable of shifting from objects to interfaces (Bonsiepe, 1995), which paved the way to web design and then mobile applications.

Two turning points might be identified as switchers of the role of designers and design from being part of culture or being actors within a specific professional subculture (Julier, 2000) between fine arts or autonomous arts and industry or technology, to becoming switchers (Castells, 2010) in networks and thought leaders in media, academia, and society. One might be set in the mid-1990s and the other in the second half of the first decade of the 2000s. In 1995, Philips launched their “*Vision of the Future*” project (Lambourne, Feiz, & Rigot, 1997) in collaboration with Francesco Morace’s Future Concept Lab in Milan. This program identified 60 concepts for the future, as generated by a foresight matrix tool defined through qualitative research. While the aesthetics of the related maquettes proved influential for years to come, it was the methodology that connected design with foresight in an unprecedented fashion. Soon after, Philips Design was converted from corporate department to global service unit, with the flexibility to bring this Design Futures *ante litteram* approach to consulting clients like Renault, Levi’s, Nike, and embed its principles, grounded in the didactical praxis of Domus Academy in Milan, in educational institutes like TU Eindhoven, The Netherlands.

4.2. The rise and fall of Design Thinking

Then, a decade or so later, designers and design leaped from future envisioning to thought leadership, with the rise of Design Thinking, championed by firms like IDEO and their founder, Tim Brown, who represented design as a major factor towards innovation in both outcome and process (Brown, 2009). Design Thinking was grounded in both empathy with stakeholders and emphasis on their participation, as developed since the 1900s by designers like Bruno Munari (Munari, 2017) and in the more recent 1980s humanist vocation of Domus Academy in Milan. Design Thinking soon became the people-focused, constructivist alternative based on participation in strategic planning and quantitative or statistical methodologies, driven by positivist affirmation.

In synthesis, the industrial design management approach behind both visionary programs and innovative products historically maintained humans at its core, using qualitative research, trend research, and Design Research, where one might say, both Design Thinking and Design Futures find their roots. With Design Thinking as an ideological blueprint

and Design Research as an operational set of tools and methods, designers developed from the specialists injecting aesthetics into industrial products to the holistic alchemists capable of transforming research processes from reifying “*world mirroring*” to appreciative “*world making*” (Gergen, 2015).

One thing was, however, to integrate the voice of “*the rest of us*” in technology roadmap-driven design processes by qualitative research; another challenge -and a whole new challenge- would be represented by the ambition to leverage automated processes in Design Research, with particular focus on foresight and futures.

5. Automation and the future: from ancillary functionality to core competence

In 2013, foresight companies began automating their research. Previously, foresight companies were leveraging a wide range of techniques and tools (Bell, 2003) to deliver people-focused products and projects, e.g., including horizon scanning, socio-cultural trends, and scenario development. The compilation, monitoring and tracking of references and sources, e.g., international trendsetting magazines in fashion futures, might benefit from some levels of digitalization but manual inputting and human capacity were always needed to select single signals and manifestations by assigning them relevance and meaning, to then cluster them in coherent and actionable trend narratives. Then, automation came in, and after years of working with the business, trend analysts heard increasingly often not to expect any more work. However, foresight firms, design agencies, and individual consultants in the business of the future still had clients who wanted research-based insights into what would come next, with high relevance for their markets and industries, therefore, ultimately, for their clients.

So, there was work, and there were still trend reports or foresight papers to be written. Only, the additional challenge went beyond the actual futures thinking and envisioning, as trend researchers and foresight professionals increasingly explored different ways to integrate automation into their processes and products. For example, after writing an exhaustive 70-page report about wearable electronics, a topic which was very much in vogue in that decade, a trend researcher might turn that same paper into a 10-page report without losing any value using the output from automation. This kind of summary, while mostly automated and therefore relatively inexpensive because of the workload, gave readers the gist of the future of a topic. Firms, therefore, began offering gifts to their clients. They still required a great deal of research, even with the automation, but they were popular with clients who were both budget-conscious and time-poor. Each gist gave clients an introduction to the future of a topic without giving them a false sense of security that they fully understood the issues or their implications. So, a few years after being told that they would no longer have work with their foresight company, tech savvy trend analysts still had plenty of work, only different as time consuming and budget intensive workshops, which were a preferred format for participatory futures research (Jungk & Muellert, 1987) in Design Research, started being replaced by online scanning and automated reporting.

5.1. The impact of COVID-19

Then, COVID-19 came. Covid-19 had several major impacts on foresight consulting and futures research, as it put to a stress test all earlier forecasts of a linear nature and gave the floor to Wild Cards and Minority Reports, while supply chains froze globalization by interrupting industrial production and people discovered how human to human contact was to be carefully managed and preferably avoided. Designers moved their Design Research workshops, including futures explorations, online, thanks to platforms like Miro, which enabled continuity by the co-creation and delivery of valuable programs and projects despite the remote work modality (Brand & Mink, 2022). Meanwhile, large language models (LLMs) began to show up online, which led tech-savvy foresight professionals to explore ways to help them reshape their work according to the new, radically changed business, social, and cultural context. For example, the gists could be improved, and the raw data could be refined when coming from their automation. In this whole new world, however, processes and formulas might have remained the same, robots started to take over from humans, the aggregation of data, and the sketching of storylines by scanning the internet and clustering information. This meant, researchers with digital competencies could step up to managerial challenges in terms of inventing new services and propositions, well beyond their functional portfolios of data science and software writing. Even more so, foresight professionals with a solid understanding of both digital tools and futures research principles were increasingly free to market their services more dynamically and contribute to the R&D of the business directly.

Once ChatGPT3.5 launched, it was obvious that research firms that invested in the automation of services needed to respond and, if possible, anticipate the next generation of LLM-based possibilities. Some went off in terms of adopting ChatGPT as the sole reference in their research and consulting work, benefiting from cost efficiencies. For others, the priority was to use automation to enhance human collaboration based on their own experience with automation and the

awareness that, next to the automated opportunities, a mature research proposition based on ChatGPT as an automated foresight engine had to manage all risks derived from its limitations. Reasonably expecting, based on “Trained Judgement,” that LLMs would be met with extreme hype for both utopian and dystopian agendas, advanced researchers began to explore what the technology might look like after the hype evened out and digital tools would be integrated into business-as-usual. For example, gists were increasingly feasible, leveraging more refined raw data before a human ever touched it. These reports were so good that we could easily sell them to clients, but not everything was perfect, as human-performed and validated research would be. For example, it became obvious that LLMs did not always provide valid sources. The sources provided in the reports were usually dead-end links or the homepages for general websites such as Google.com. So, researchers had to exercise their “Trained Judgement” and correct and improve digital output, e.g., by using their sources that had been added to their archives and rubrics for the past 10 years, automatically. The potential solution to the dilemmas created by this technological revolution was not a-critically adopt it critically but to create collaboration tools with an LLM as the core of a hybrid research process, involving humans with very specific roles and functions in the new processes. Then, ChatGPT4.0 came and everything was changed, for good. Or not?

5.2. Framing an impossible balance: Design Research and Automated Foresight

If COVID-19 took the world by surprise, post-COVID-19, with the wars in Central Europe and in the Middle East, with the rise of inflation and the surging energy crisis, and with the populist turn in global geopolitics, took us all by storm, including foresight professionals and designers. The world turned backwards from the promises and prospects of growth and prosperity that were made during COVID-19.

In this climate, Design Thinking found its nemesis, as signaled by articles about the major crisis at the firm that officially invented it, IDEO of the US (Wilson, 2023). After being a major metaprogram in networks (Castells, 2010) from the 1980's to the 2010's at cultural and at business levels, design seemed to have lost its edge, with historical departments dramatically downsizing, with historical firms going bankrupt or on sale, and with the whole Design Thinking discourse being rapidly diluted by its success, namely by endemic yet superficial adoption in generic and therefore unimpactful through education, management, and society.

During this time, in parallel, many futurists on LinkedIn were talking about utopian and dystopian extremes on the future of Gen-AI. So, advanced researchers in automated foresight started adjusting their practices and their communications to speak more realistically about the machine's capabilities based on a decade of experience with machine learning and my year of experience with LLMs.

The accelerating crisis in Design Thinking and the increasing challenge to frame and operationalize in a realistic but cutting-edge fashion the Gen-AI opportunities of automated foresight, led to the key challenge addressed in this reflexive paper:

How can participatory Design Research and Gen-AI-based automated foresight merge in a hybrid methodology, structuring a meaningful and repeatable Design Futures process?

5.3. Towards Design Futures: hybrid experiments between Design Research and LLMs

In the very early 2000s, the only touchpoint among Design Research, trend research, foresight, futures, and automation might have been identified in the digital management of references and sources. Within a research field where the tracking, monitoring, and rapidly accessing existing articles, papers, books, conference abstracts, and any other manifestation in visual or written media was mission-critical, early automation pertained to archiving and managing content in rationalized records and virtual folders. The focus, especially in the design industry and the trend research growing sector, was on individual talent and creative intuition by foresight specialists, according to the principle of “genius forecasting” (Kuosa, 2016); therefore, the role of automation was limited to functional simplification and digital support. This started to change as the 2010s were closer, since by then, a common app like Pinterest might enable the creation of a visual mood board, e.g., around a color, at the time, and with the effort of one click. While generations of trend analysts and strategic designers might have invested in their past practice workdays on magazines and research trips to study, analyze, and extract every nuance of orange in the next half decade, a simple online resource like Pinterest would offer the solution, at zero cost. Of course, nuances like philology of sources and cultural interpretation of manifestations, however, the difference in costs in human labor was radical, and social media has never provided a safe space for nuances.

In the 2010s, automation in trend research for foresight, therefore, seemingly shifted from functional support to challenging competition to trend analysts, e.g., with the emergence of increasingly sophisticated bots capable of scanning

the internet and collating trend reports while combining cost efficiency and acceptable quality. Since the start of the decade, e.g. in The Netherlands, in parallel, a number among said trend analysts started a migration from corporate design departments to individual and small firms, sometimes through redundancy and unemployment, in a market restructuring process that saw, in parallel, the emergence of formal foresight and futures consulting education in the professional and applied fields. At the same time, both search engines and social media redefined the very nature of advertising, marketing, and media communication in general. While foresight researchers integrated new digital technologies and consultants repositioned themselves in social media, LLM's were increasingly involved as tools for analysis.

6. Towards Automated Design Futures

Step by step, the authors of this reflexive paper engaged in their personal and professional dialogue, whereby the distant worlds of constructivist Design Research and automated foresight were mutually explored in search of convergence. Since 2021 and with a higher degree of intensity since January 2024, through several collaborations over this time, the authors designed and tested ideas and insights in each other's competencies and qualities, to sketch and model the basis for an actionable, repeatable, and validated process with key qualities that they identified along the way as being critical, liminal, and creative as a hypercreative process (**Figure 1**).

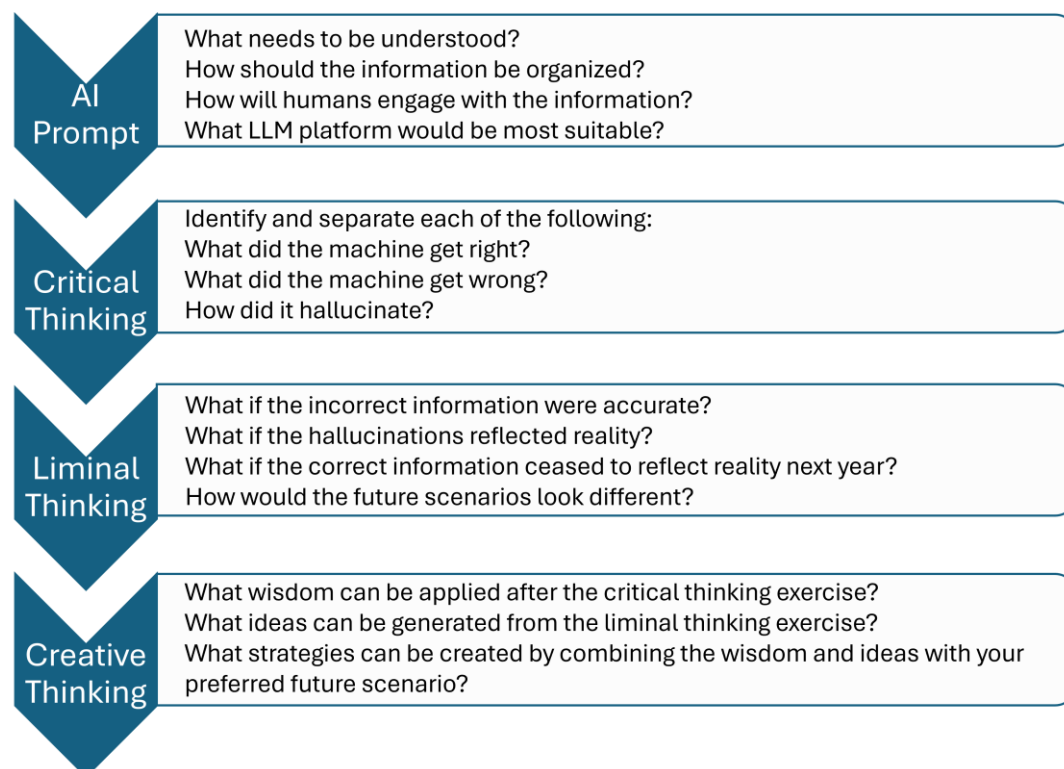


Figure 1. Hypercreative Process (Draeger & Bevolo, 2025).

6.1. A reflexive overview of earlier collaborations

A first collaboration was substantiated by the introduction of automated foresight as a triangulation within a Design Research based study, involving 10 explorative interviews with thought leaders and senior industry experts, leading to the sketching of an analytical/generative foresight matrix tool, which was validated by 22 subsequent interviews with designers, design thinkers, and emerging talents between 25 and 35 years of age in the given “phygital” of the business sector under investigation (Bevolo & Amati, 2023). Between visionary thought leaders and industry insights about the future of business events, automated foresight generated several hypotheses in the form of a report, whereby substantial curation and conceptual clustering were required to select and highlight meaningful and relatable findings across qualitative

research and automated output. From this start, it appeared evident how much value could be extracted through engaging in a dialog, however, requiring researcher intervention by their Trained Judgement.

Then, ChatGPT 4.0 revolutionized automated research, automated foresight, and, therefore, Design Futures. Just how much has changed is yet to be proven. For sure, it inspired the authors of this paper to stretch the boundaries of their dialogue towards new collaborative opportunities. Such new opportunities reverted earlier perceptions of machine output as usable from 20/80 to 80/20, meaning that by skilled fine-tuning, the dialogue of the researchers resulted in a rapidly increasing relevance and applicability of an LLM's direct deliverables.

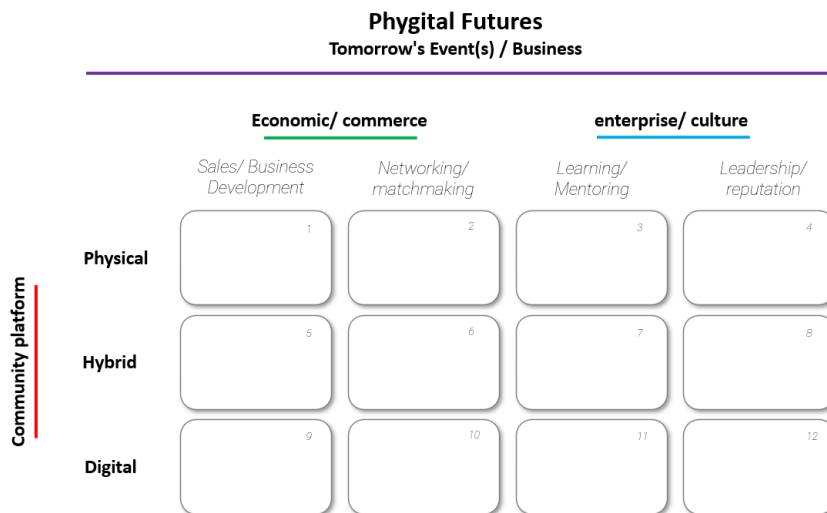


Figure 2. Phygital Futures Matrix (Bevolo & Amati, 2023).

Such new opportunities were translated into an experiment whereby the two authors attempted, with success, to update the content of the “phygital” tool presented in the Design Research paper by Bevolo & Amati (2023). With proper prompting and a wave of refinement loops, the automated foresight system and process delivered valuable concepts and content to fill in the “phygital” matrix anew, hence fulfilling its analytical purpose. Trend-anticipating content generation proved effective and feasible but required several iterations. An update of the tool itself proved unfeasible, as the machine generated several structures with an equivalent graphic look and feel but without those interdependencies across socio-cultural versus industry-specific parameters that result in the analytical and generative qualities of said matrix (Figure 2).

This peer-reviewed submission on “phygital” futures of business events (Bevolo & Draeger, 2024) was accepted for publication after several elaboration and improvement loops between event management and futures studies. The relatively unexpected challenge to edit the outcome of a vibrant and experimental research process into a scientific publication in foresight stimulated the collaboration between the authors to further develop towards applied research project opportunities.

The next opportunity to further scale up and refine the dialogue between Design Research and automated foresight came with an invitation to one of the authors by the International Association of Lighting Designers to deliver a future-focused keynote at their flagship European event, EE2024, in June that year, in London. The invitation was based on a professional reputation acquired since the early 2000s as a Design Research-based futurist in the professional domains of urban futures, lighting innovation, and strategic design.

Nevertheless, since 2016, said author had no opportunity to build up a critical mass in terms of major foresight projects or any groundbreaking futures research. The deadline and the time of invitation offered no more than 4 to 5 weeks for the design and delivery of the keynote PowerPoint slides, which is a very short lead time even without having a recently updated research database. Lastly, even more intimidating, the audience of the keynote address would include hundreds of lighting designers, and the actual “aristocracy” of lighting design worldwide.

In reaction to this invitation, the two authors of this paper convened and rapidly concluded that this was “the” opportunity for them to consolidate and put to the ultimate test their hybrid research approach, between design and automation, through Trained Judgement and professional dialogue. The process started from several iterations whereby LLMs were interrogated about the topic, namely the future of lighting design, resulting in the generation of about 100 vignettes representing future “signals”, individual manifestations of possible, probable, and preferable lighting design futures. These vignettes were matched by trend reports and foresight outcomes, whereby the authors converged towards a robust overview, both verbal and visual, with some 50 vignettes capturing the essence of the topic at hand, through bullet points, sources, and images.

The next step entailed refining the final report and clustering “signals” into “trends”, or thematic aggregations of three signals each. Furthermore, a parallel trajectory with interviews with seven industry seniors and thought leaders in this design sector was designed and delivered to identify gap areas not addressed by Gen-AI scanning, while refining directions and results from automated foresight. The outcome was a set of 65 PPT slides, which was warmly welcomed in London by the IALD members as a valuable kick-off keynote for their Congress.

The presentation highlighted the dialectic nature of the authors’ research, which was positioned as a dialogue with Gen-AI about the future of lighting design, where both the verbal and visual machine output should be considered relevant data. As a follow up and further validation of the relevance and validity of this research project, despite the short lead time and the absence of any financial resource to enable it, the authors were invited to capture its essential milestones in a trade article, printed on a leading trade magazine within the lighting sector (Bevolo & Draeger, 2024). Once again, the authors tried to shift from automated generation of foresight “signals” to the digital creation of a foresight matrix tool, namely an update of a foundational 2006 urban futures matrix, grounded in a structural framework designed by Francesco Morace of Future Concept Lab for Philips Design in the mid-1990s. (Figure 3)

Once again, the machine proved inadequate to forge and frame a set of parameters about the future of a given topic into a working / workable foresight matrix. The authors came to the observational conclusion that LLMs could “play with words” around existing parameters on a horizontal and vertical axis. However, it was unfeasible for them to create the actionable relationships between socio-cultural drivers and sectorial strategies where the analytical and generative “engines” of said tools lie. The failure to generate a foresight matrix tool came half a year after the first attempt, also negative in its outcome, as reported above. To this day, the only Gen-AI intervention on matrix tools has been a generic update of their parameters, but never the actual design of potential relationships among them.

		ACCENT ON INDIVIDUALS		ACCENT ON GROUP	
Socio cultural drivers City strategies		IDENTITY (Risk Society)	EXPLORATION (Experience Economy)	BELONGING (Networks/Comm.)	SUSTAINABILITY (Empathy/Biosphere)
FOCUS ON TIME	ACCELERATION (Enabling/Supporting people's lives)	Liquid city	Brandscape city	Eclectic city	Open city
	MEMORY (Reconnecting citizens /Cities to context)	Dialog city	Repurposed city	Regionalized city	Geomantic city
	SEMIOTICS (Leveraging urban objects)	Integrative city	Augmented city	Storytelling city	De-mineralized city
	CONNECTIVITY (Leveraging hybrid systems)	Playful city	Hybrid-system city	Themed city	Agricultural city
FOCUS ON PLACE					

Figure 3. Urban Futures Matrix, the 2014 original (Bevolo & Rosenius, 2014).

6.2. Gen-AI hallucinations as hybrid hypercreativity

While the impossibility of generating working tools like foresight matrices might sound like a setback, the authors explored the notion of hallucinations as hypercreativity for the first time, which somehow accidentally led to yet another unexpected breakthrough in methodological terms. Hallucinations had always been discussed as byproducts of LLM-based explorations without any relevance or validity. In essence, when Gen-AI is not capable of finding an appropriate reply to a prompt, it would articulate absurd answers, aiming to at least react to the inquiry. As an unprepared pupil shooting random answers in an unlikely attempt to earn a sufficient grade, Gen-AI would just churn out textual and visual output without apparent coherence and consistency with the expected outcome. The key keyword in this last sentence is “apparent”, as the authors found out.

During weeks of research, LLMs repeatedly presented “Bamboo Design” as a relevant design trend for sustainable solutions and future aesthetics. In spite, or maybe because, of their Trained Judgement in automated foresight, where hallucinations were discounted as irrelevant, and in design trends, where bamboo sounded like any other material, the authors convened to exclude this “signal” from their analysis. Yet, in April 2024, “Materia Natura” emerged at the Milano Design Week as a leading aesthetic and strategic theme (Banks, 2004), with “Bamboo Design” being identified among the top ten trends. Then, in April 2025, again at the Milano Design Week, such material was elevated to trendsetting “signal” by Gucci, which, in collaboration with former OMA AMO renowned architect, Ippolito Pestellini Laparelli, at the helm of his 2050+ consulting firm, presented an entire show, named “Bamboo Encounters” (Tsimpou, 2025).

What seemed to be a hallucination when generated by the machine proved to be a very valid trend signal when scanning a rather obviously trend-setting event like the Milano Design Week. Similarly, “Solar Design” was repeatedly generated by the authors’ LLM’s which were prompted to study the future of lighting design, which initially appeared to the researchers as a high-tech-biased hallucination. Nevertheless, again at the Milano Design Week 2025, “Dutch solar designer Marjan van Aubel proposed a future where solar energy is holistically embedded in the design process, rather than an afterthought add-on. Working with Lexus, her “8 Minutes and 20 Seconds” installation took a life-size model of the LF-ZC electric concept car, sliced into 11 transparent sheets, while energy was sourced from solar power captured by organic photovoltaic cells and stored in built-in batteries. The car’s color changed as the sun charged the battery, all to the natural sounds of rustling bamboo and the sun, based on sounds collected by NASA. The project title refers to the time it takes for a light particle from the sun to reach the Earth. “My work aims to change the perception of solar energy,” she said. “I hope that you will see solar with a new perspective.” (Banks, 2024).

Again, besides reiterating “Bamboo Design”, it appeared possible, if not likely, that automated foresight generated an apparent hallucination, which proved to instead be a valid “signal” deviating from linearity and mainstream trends in the given field of lighting design. The authors reflected on their research experience and summarized it in a peer-reviewed paper for the Journal of Futures Studies (Draeger & Bevolo, 2025), where they proposed hypercreativity as an alternative interpretation of those “signals” otherwise assessed as hallucinations.

Instead of being oddities without use, the authors there proposed to consider former hallucinations as the most fertile and inspiring output by automated foresight LLMs. At the same time, the need for critical thinking, at best within the context of Trained Judgement, appeared even more radical than in the case of Gen-AI-based linear forecasting and coherent and consistent foresight outcome. To leverage hypercreative output, human judgment is required in converting what seems odd into a rationalized and structured outcome. This combination of man-machine creative loops might resemble the working of the “Generation / Synthesis” diagram of divergence/convergence, representing the essence of idea generation in the popular Business Model Canvas (Osterwalder & Pigneur, 2010). This same basic intellectual mechanism might be seen as the foundation of the Double Diamond presented by the UK Design Council in 2005, and since then has arisen as a standard reference for Design Thinking processes of creation and innovation (UK Design Council, 2005-2025). By adopting hallucinations as a hypercreative opportunity, the authors therefore posit that automated foresight shifts its focus from positivist linearity in forecasting to para-constructivist, postmodern hybrid integration of human judgment with machine output, whereby original outcome is feasible, equivalent to Wild Cards in earlier foresight (Kuosa, 2016).

7. Future Research & Limitations

7.1. Directions for future research: Leisure Futures as a repeatable process

After 18 months of intense collaboration, leading to applied articles and academic papers, the authors felt the time had come to structure their findings in a repeatable process, whereby a hybrid notion of automated foresight would be integrated in a Design Futures process. As a first step, the authors distilled said process, with a tactical focus on Leisure Futures,

within another peer-reviewed submission, which was printed in March 2025 (Bevolo & Draeger, 2025). The authors sketched three basic steps in this Leisure Futures process:

- Longer-term futures Archetypical Scenarios of Leisure Futures, modelled on the standard reference by Jim Dator (Dator, 2009), re-specified for the leisure domain by Gen-AI automated foresight (Bevolo & Draeger, 2025).
- Based on said Archetypical Scenarios, a novel Quadrants Tool, or 2x2 Leisure Futures matrix, where the four scenarios by Dator were interpreted as two pairs of key drivers, namely Growth versus Collapse, and Discipline versus Transformation, resulting in four mapping quadrants: Maturation, Innovation, Mitigation, Exploitation, (Figure 4) operationalizing Archetypical Scenarios to assess alignment of individual manifestations, or “Signals” with each quadrant;
- A specific format to capture individual manifestations of future trends, or “Signals”, enabling users to provide a complete description from naming to potential Research Question inspired by each manifestation, with indication of optimistic, pessimistic, uncertain developments, and the suitable actions that such manifestation might require in the field where it might have impact.

Although there is no socio-cultural foresight matrix, the authors posited an integration of socio-cultural drivers in the form of Archetypical Scenarios with dynamic trend research by generating “Signals”. At the center of the process, the Quadrant tool enables mapping sessions in workshops, in partial fulfilment of the constructivist requirement of participation and co-creation. Additionally, the authors found that this analysis tool works equally well as a strategy development tool, pairing the scenario archetypes with strategy archetypes. The authors will further expound on their theory for strategy archetypes in future publications, which they expect to further bridge the gap between strategy and foresight.

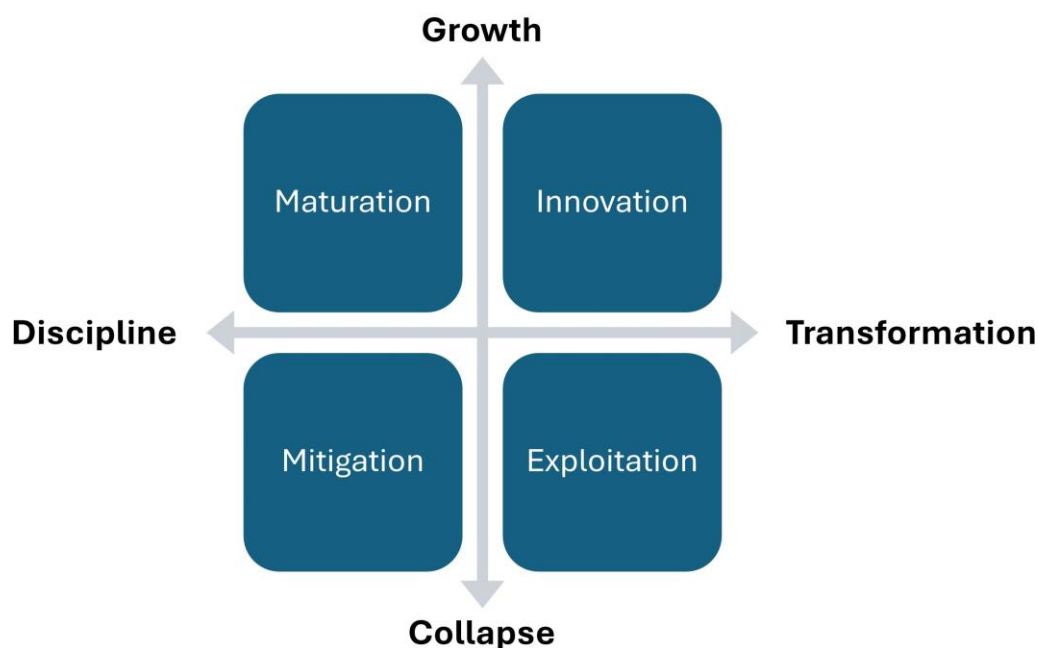


Figure 4. The Leisure Futures Quadrant Tool, based on Jim Dator’s scenario archetypes (Dator, 2009), is used as a trend analysis tool and a strategic development tool, utilizing strategy archetypes (Bevolo & Draeger, 2025).

In a separate paper within this same Special Issue of IJDAS, the authors follow the lead of Dr. Adriaan van Liempt, Senior Researcher and AI Pioneer at Breda University of Applied Sciences, who devised and designed a scaffolding technique to write multiple prompts that drive the “Signal” generation by Gen-AI. It should be noted how said “Signals” might also be generated manually, from personal experience or professional judgement. However, the authors posit that a generation thereof by LLM’s, for subsequent critical review within workshops, will provide a higher quality of hybrid human-machine process integration and, with the discount of Gen-AI biases towards High Tech-based “Signals”, will offer users the

opportunity to encounter and incorporate into the process those hypercreative hallucinations which might make the difference in envisioning alternative futures that may otherwise be non-imaginable.

7.2. Beyond limitations: converting reflexive practice into educational praxis

The primary limitation of the above trajectory, to the authors, is its conversion into everyday practice. While business opportunities might exist within consulting projects, the authors took a special interest in educational applications whereby students might learn about Futures Literacy while engaging with Gen-AI for automated foresight. At the time of submitting this reflexive paper, the authors are collaborating on the first ever testing deployment of this hybrid process bridging Design Research principles with automated foresight practices in the context of the educational program “Leisure for Change” at the Academy for Leisure and Events, Breda University of applied sciences, The Netherlands. There, some 100 students of their 3rd year in vocational education for leisure professions and some 10 educational professionals acting as instructors and professors, are benefitting from this approach with guidance represented by the peer-reviewed paper and a minimal background in Futures Literacy. Results will be formally communicated on 26/08/2025, in an accepted joint presentation of the professor “Leisure in Social Context” at the Academy of Leisure and Events, BUas, with faculty members and one of the authors of this paper at the WLC 2025, the World Leisure Congress 2025 organized by the World Leisure Organization, in The Netherlands.

The preliminary positive reactions by students and staff involved seemed promising, given their lack of specific training in foresight, be it analogue or automated. An extension of the program to the Academic Year 2025/2026 is in finalization and therefore, the conversion of experimental practices into a didactic cycle in professional higher education seems an achieved milestone in the multidisciplinary collaboration by the authors. Perhaps, undoubtedly, there are other thinking models or tools that might be included for general futures thinking, but these three seemed the most relevant for enabling automated futures work within an educational setting requiring actionable instructions, simplified (but not simplistic) information, and an inspirational edge to motivate student engagement and staff commitment.:

8. Conclusion

The authors recall how their first dialogs presented LLM’s output objectively for them to comment on, from the perspective of their Trained Judgement. At the start of their multidisciplinary collaboration, they designed a process for building the output that would be most relevant for the topic, as ancillary triangulation in a Design Research constructivist process. This process became the theoretical foundation for peer-reviewed publications, which we spun out into more dialogue, more collaboration, and ultimately a hybrid peer-reviewed paper, where the Design Research frameworks were leveraged to generate LLM-generated content, updating the foresight directions for the given sector in the rapidly changing post-pandemic context. Within the paper, Gen-AI led to integrated output within existing tools, therefore contributing as a hybrid generation to the presentation of findings. In truth, this thinking model process was very similar to what a futurist does anyway, regardless of automation. The authors had to think critically about our scanning hits, think liminally about their implications for the future, and think creatively to convert, relate, or position Gen-AI output into the context of design trends, scenarios, and strategies. So, doing the same, and doing more between Gen-AI and Trained Judgement, with automation, just seemed a natural fit.

The collaborative experimentation continued with applied research for delicate keynote, as one author had to address the best lighting designers in the world, about the future of their very profession, lighting design. The authors took a risk, and it paid off, as the backbone for a repeatable process and a hybrid methodology was born in those intense weeks, under the pressure of an early deadline for a public event presentation.

Having developed their findings and empirical experiences, supplemented by reflections and reflexivity on hallucinations as hypercreativity, into a methodological, if not theoretical, foundation, their paper on Leisure Futures might be labelled as the breakthrough paper. Here, practice is converted into an actionable, applicable, repeatable process. It describes the curriculum the authors designed for one semester in a leading vocational international institute of higher education, describing an analysis approach which can also function generatively for strategy development.

So, the authors have seen the hype fall flat as the machine fails to replace the need for human imagination and ingenuity. But they have also identified the opportunity to rethink hallucinations as possibilities, and the methodological space to integrate man and machine in hybrid processes. In conclusion, the authors like to think, if not to posit, that through the

Gen-AI revolution, humans will still be needed in their foresight, design, and futures research work for their unique critical thinking and Trained Judgement, which means we might still need to be paid for our mission-critical work. Eventually, the increasing complexity of this world and the increasingly sophisticated nature of automated foresight might even mean that Design Futures professionals will be so in demand that they might aspire to be paid better.

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