Oracolo:
a more-than-human envisioning tool.

AI text-to-image as a support
for futures thinking conversations

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Oracolo

Accelerating changes and emerging technologies

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Abstract

In this accelerating world signified by the incredible evolution of technology, design is fraught with fast-paced changes that call for increasingly more efficiency. It has therefore become essential to integrate foresight as a practice to deal with uncertainties, as well as identify a way in which new technologies – such as generative AI – can play a supportive role in design processes. Processes which, as of now, appear to be threatened by them.

The core idea behind this thesis is to face these complexities by leveraging AI text-to-image to enable and enhance human-to-human conversations in the envisioning phase of the futures thinking design practice – effectively, employing this technology to stimulate, translate and transfer imagination between people.

This thesis has been structured into three sections: the research chapter, the development chapter, and, lastly the product chapter.

The first one inquires about the rapid evolution of generative AI, the relevance of the futures thinking design practice, and the opportunities that emerge at their intersection.

The second chapter explores the processes that accompanied the designing of the Oracolo tool, diving deep into the study of vision building and text-to-image prompting that, eventually, laid the foundations for the dynamics that govern it. These dynamics have been evolving during the frequent prototyping sessions, which have proven fundamental in defining the final tool.

Finally, the last chapter explains the product itself, all of its versions, and the structure of the game.

This research will thus explore the need and the benefits of a more-than-human envisioning process. Moreover, prove how the dynamics of the Oracolo tool identify a role for generative AI: smoothing out the early design process phase and offering a chance to deal with the fast-paced contemporary as active participants in its design.

Dynamic reality calls for literacy in design futures

In recent years, reality has developed as fast as ever and humans find it difficult to keep up with technological development, as a consequence, design action is becoming more challenging and demanding. We are landing in a historical period in which, as Roberto Poli, futurist at UNESCO, discussed during his conference at Politecnico di Milano, changes are both out-of-scale and accelerating too fast.[1]

One might say that changes have always been part of our lives, but their scale nowadays is unprecedented as well as their speed which is out of control. In this kind of context ruled by uncertainty, the tools we have been using until now are no longer sufficient to face this reality and the problem might stand in the way we extract information to face these changes.

All the information we use to face the future is usually extracted from the past. However, the information from the past is not enough to support us in facing the future, and this is the reason why anticipation plays its role: we need to extract information from the future to face it. H.G. Wells, while stressing the importance of futures literacy, explains that "all these new things, these new inventions and new powers, come crowding along; every one is fraught with consequences, and yet it is only after something has hit us hard that we set about dealing with it."[2] In this sense, in this kind of situation, we might need to mature new skills to design alternative futures to pursue to open up to possibilities and not limit ourselves by facing the

[1](Poli, 2023)

[2](Wells,1989, as citedy in Candy, 2019)

[1] Poli, R. (2023) "Introduction to Futures Studies," lecture notes, Design Futures 058073, Politecnico di Milano, delivered 20 February 2023.

[2,4] Candy S.(2019) "Gaming Futures Literacy" in Miller, R. (ed.) (2019) Transforming the future: Anticipation in the 21st century. London, England: Routledge.

consequences of these fast and big changes. This could be possible with the adoption of a different kind of approach such as future thinking.
This method is indeed focused on foresight and not on forecasting, in designing new directions instead of predictions, "is the idea of possible futures and using them as tools to better understand the present and to discuss the kind of future people want.[3]

[3](Dunne and Raby, 2013)".

> And yet, in this world of "amid pervasive uncertainty and accelerating change"[2] as Stuart Candy states when discussing his challenges and opportunities, the necessity "is to make high-quality engagement with the yet-to-be more widespread."[4]

[4](Candy, 2019)

Here comes another important issue: It is fundamental to underline also the nature of the future, which is shared and collective. For this reason, all the practices that deal with it must be open and participatory in the best way possible. It is necessary to share this approach with tools that can inclusively support literacy, to make the design of an equal and sustainable future more accessible.

Computational tools in the early stages of the creative process

Despite fast technological development calling for a more agile design method to keep pace with its fast progress, the technological computational support itself is not as integrated into the first stages of the

[3] Dunne, A. and Raby, F. (2013) Speculative everything: Design, fiction, and social dreaming. London, England: MIT Press.

design process as in the further stages in which, for example, CAD models are used. The reason for this unbalanced computational support is that the early creative process is "an exploratory cycle of experimentation and evaluation (Schön, 1983) that meanders between phases of discovering variables, reframing concepts, envisioning solutions and creating designs (Mendel, 2012)."[5]

In this context, as Philippa Mothersill pointed out, "These discrepancies between the explicit requirements of computational design and the nebulous experimental journey of early creative explorations highlight the challenges when applying computational design tools to this stage of the process."[6] While talking about this unbalance she also presents the diagram by Bernal, Haymaker, and Eastman (2015) that illustrates the different phases of the design process, and the human and computational tools available. (fig.1)

[5](Mothersill and Bove, 2017)

[6](Mothersill and Bove, 2017)

>fig.1
Bernal et al. (2015) diagram of human and computational tools available for the 'actions' in the design process as cited in Mothersill and Bove (2017)
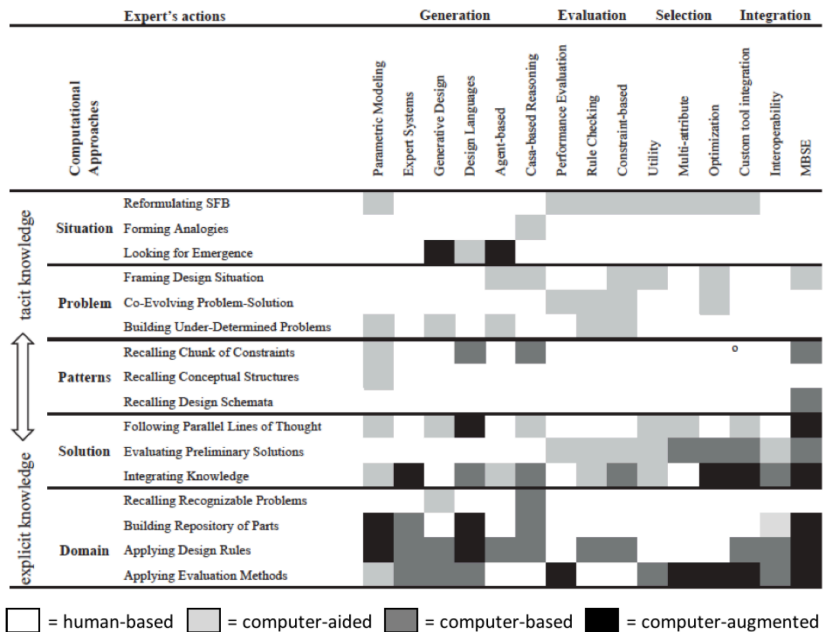
[5–7] Mothersill, P. and Bove, V. M., Jr (2017) "Humans, machines and the design process. Exploring the role of computation in the early phases of creation," The design journal, 20(sup1), pp. S3899–S3913. doi: 10.1080/14606925.2017.1352892.

She underlnes how "fewer darker squares are present in the early activities of the design process indicating a lack of computational tools available, which Bernal et al. (2015) posits is due to the fact that...

> ... the explicitly-defined hierarchical data structures required for computer programs are limited in their ability to support the more heuristic, abstract thought processes and ad hoc methodologies present in the variable definition stage."[7]

[7](Mothersill and Bove, 2017)

This opens up new possibilities and challenges especially considering the development of generative AI nowadays, which is, for instance, a model that can easily support variables changes and whose result can be obtained in a short time. Its integration can also be used to empower designers in a more inclusive and cooperative workflow, that can be more flexible while still maintaining its agile properties. In this dimension, "agile" is not intended as the tendency towards a mere streamlining process, but as a more fluid and holistic one.

AI and the need for conversation

By asserting that relying on AI could be useful in the design process, it is essential to first underline how this entity could be supportive. Paul Pangaro, President of the American Society for Cybernetics, explains that while interacting with a generative AI model we are not establishing a real conversation.

While chatting with Chat GPT for example, we are thus supporting a conversation between us and ourselves, where a machine answers to the input given by aggregating statistical frequency and likelihood terms going together.[8] The 21st century instead, is calling for design for conversation to build shared goals.

[8](Pangaro, 2023)

The purpose of collaborating with AI must be, at this point, a way "to facilitate the emergence of conditions in which others can design – to create conditions in which conversations can emerge – and thus to increase the number of choices for all."[9]
Concerning this topic, it is furthermore essential to reflect on the evolution of AI itself.
We should take into account that "change happens in the wake of a duet, where humans and non-humans mutually evolve and resonate with each other."[10] Since human actions and products are inevitably machine-learned by AI (such as all the pictures used by the Generative AI systems), ...

[9](Dubberly and Pangaro, 2019)

[10](D Cianfanelli, Claudia Coppola and Tufarelli, 2022)

... we must also consider AI as an opportunity otherwise, it will evolve because of our actions, but without letting us take advantage of this evolution.

Considering this, we can assume that if we design a way in which technologies can amplify human

[8] Salvaggio, E. (2023) AI Images, Class 3: Guest Lecture, Paul Pangaro. Youtube. Available at: https://www.youtube.com/watch?v=UMW6Q0wS7qY (Accessed: April 7, 2023).

[9] Dubberly, H. and Pangaro, P. (2019) "Cybernetics and Design: Conversations for Action," in Design Research Foundations. Cham: Springer International Publishing, pp. 85–99.

potential keeping designers – their discussions and choices – at the core of the systems, we can let humans be part of the equation. Humans can participate actively and consciously in these more-than-human interactions, regaining in a certain sense agency over them, and taking advantage of the results.

Staying along with the complexity is needed, and necessary for a sustainable evolution.

Objectives, purpose and limitations of this research

This research has been oriented on three goals.

>1
The Inclusivity of futures thinking literacy
It aims to facilitate and promote the envisioning process of future scenarios inclusively by supporting communication between group members during the brainstorming and aligning sessions.

 >2
The computational support in the early creative stages
It wants to identify a way in which generative AI can be a computational support of the design process in the early creative phase to keep pace with the increasing acceleration of changes through a computer-supported holistic approach in alternative generation.

[10] Cianfanelli, E., Claudia Coppola, M. and Tufarelli, M. (2022) "Overcrowded ecologies: Designing value through more–than–human factors," in Human Dynamics and Design for the Development of Con- temporary Societies. AHFE International.

>3
AI management and understanding
It aims to allow the participants to manage the AI
complexity and stay along with it, regaining agency in
a way it can amplify human potential.

The output of the thesis is the design of a framework
that can create a bridge between AI, the futures
thinking design practice, and the participants, which
can evolve in the future in different shapes and
mediums.
As an integrated product designer, my personal
educational goal for this thesis has been to face
the complexity of an emerging technology, such as
generative AI, in a frame of 9 months and integrate it
into a design that was supposed to still be meaningful
at the end of the project.

Avoiding obsolescence and designing
real future needs have been my
focus throughout the process. As a
second goal, I wanted to recognize
the impacts of technology in society
and discover its ethical opportunities,
underlining the responsibility of the
designer during its practice dealing
with it.

This has been possible thanks to a futures thinking
approach that is not only a topic of research, but a
method I have applied myself to face this challenge.
It is necessary to clarify that this research has been
conducted from July 2022 to April 2023, for instance,
the material of the research, its possibilities, and its
limitations, have been explored in a limited time
frame at the early stages of its evolution.

Generative AI as a tool for envisioning

The unstoppable evolution of Generative AI

1.1.a Generative Artificial Intelligence and its exponential evolution in the creative sector.

Generative Artificial Intelligence, describes algorithms that can be used to create new content, for example audio, images, code, text, simulations, and videos and falls under the category of machine learning. As explained by Sonya Huang (September 2022) in the Sequoia Capital report, "Up until recently, machines had no chance of competing with humans at creative work—they were relegated to analysis and rote cognitive labor.

> But machines are just starting to get good at creating sensical and beautiful things. This new category is called "Generative AI," meaning the machine is generating something new rather than analyzing something that already exists."[1]

[1](Huang, Grady, GPT-3, 2022)

In this context, machines are getting involved in the design process as active content co-creators, a faculty that has, until now, belonged to humans only. The landscape of application of generative AI is broad and covers already, now at its early stage, a broad quantity of fields in the panorama of the creative sector such

[1-2] Huang, S., Grady, P. and GPT-3 (2022) Generative AI: A creative new world, Sequoia Capital US/Europe. Sequoia Capital. Available at: https://www.sequoiacap.com/article/generative-ai-a-creative-new-world/ (Accessed: April 7, 2023).

as example copywriting, code generation, media and advertising, and design.

The "evolution of better models, more data and more compute"[2] allowed its growth today, but it seems to be an incipit for an exponential growth in the future. Moreover, according to the Sequoia Capital data, the projection is that it will be the largest investment in the next few years in the field of creativity.

The large model availability, as shown in the chart, is expected to be mature by 2030 in all the fields listed, in which Ai will be able to generate professional and realistic outputs - starting from text and coding in 2023 and getting to images, video, and 3D gaming in 2030. (fig.2)

[2] (Huang, Grady, GPT-3, 2022)

	PRE-2020	2020	2022	2023?	2025?	2030?
TEXT	Spam detection Translation Basic Q&A	Basic copy writing First drafts	Longer form Second drafts	Vertical fine tuning gets good (scientific papers, etc)	Final drafts better than the human average	Final drafts better than professional writers
CODE	1-line auto-complete	Multi-line generation	Longer form Better accuracy	More languages More verticals	Text to product (draft)	Text to product (final), better than full-time developers
IMAGES			Art Logos Photography	Mock-ups (product design, architecture, etc.)	Final drafts (product design, architecture, etc.)	Final drafts better than professional artists, designers, photographers)
VIDEO / 3D / GAMING			First attempts at 3D/video models	Basic / first draft videos and 3D files	Second drafts	AI Roblox Video games and movies are personalized dreams

Large model availability: 🔴 First attempts 🟠 Almost there 🟢 Ready for prime time

^fig.2
Large model availability chart by Sequoia Capital,2022

The evolution of this technology has started a new era, where material production is no longer only human-related.

The world of artificial intelligence has given rise to a transformative opportunity that has been eagerly seized upon by numerous technology giants such as Microsoft, Google, and Adobe. Microsoft, for instance, made an investment in Open AI of about $1bn in

2019, and is also starting to integrate these models into softwares.[3]

[3](Warren, 2023)

Google has also made strides in this area forging a powerful partnerships with AI research companies, investing about $300mn in Artificial Intelligence start-up Anthropic.[4] Adobe is starting to integrate generative AI functions in the Adobe Creative Suite such as a definitive affirmation of how these technologies are radically changing the way we design. Many more are the software and machines that are starting to integrate these models and it is hardly possible to keep track of this blooming evolution of AI.

[4](Waters and Shubber, 2023)

> These moves promises to bring cutting-edge AI capabilities, setting the stage for a future where Generative AI will be largely applied in the creative sector.

1.1.b Text-to-image and diffusion models

Generative AI is however a very broad term that encloses different categories, the research of this thesis will explore text-to-image, which is a branch that focuses on the creation of images from human prompts.
With this technology, an image is tailored through deep learning models, like the diffusion ones, that are nowadays the cutting edge technology for

[3] Warren, T. (2023) Microsoft extends OpenAI partnership in a 'multibillion dollar investment,' The Verge. Available at: https://www.theverge.com/2023/1/23/23567448/microsoft-openai-partnership-extension-ai (Accessed: April 7, 2023).

[4] Waters, R. and Shubber, K. (2023) "Google invests $300mn in artificial intelligence start-up Anthropic," Financial Times, 3 February. Available at: https://www.ft.com/content/583ead66-467c-4bd5-84d0-ed5df7b5bf9c (Accessed: April 7, 2023).

image synthesis. The evolution of image creation by prompting some text started around 2012, when

"Once it was clear that deep neural network would revolutionize image classification, researchers started to explore the 'opposite' direction".[5]

The escalation of the models over the years – also thanks to the large-scale training on billions of images with a text – has evolved into diffusion models at the end of 2019.

These text-to-image diffusion models learn to build a picture "by first describing a procedure for gradually turning data into noise, and then training a neural network that learns to invert this procedure step-by-step.

[6,7](Dieleman, 2022)

Each of these steps consists of taking a noisy input and making it slightly less noisy, by filling in some of the information obscured by the noise"[6], arriving at "an unprecedented levels of photorealism and deep level of image understanding."[7]
This AI process of "denoise" for "noised" images is repeated over and over, with millions of images until it reaches sufficient knowledge. Then, it learns how to translate the random noise to a clear image, based on a written prompt of how this image should look like. This model is at the heart of the well-known Midjourney, DALL-E2, Imagen, and Stable Diffusion. The process that led us to the development of these

[5] Offert, F. (2022) Ten years of image synthesis, Fabian Offert. Available at: https://zentralwerkstatt.org/blog/ten–years–of–image–synthesis (Accessed: April 7, 2023).

[6,7] Dieleman S. (2022) "Diffusion models are autoencoders" Sander Dieleman. Available at: https://sander.ai/2022/01/31/diffusion.html (Accessed: April 7, 2023).

technologies and their popularity started with the first version of DALL-E, released in January 2021 by OpenAI. Even if the research was available, its access was not open, due to concerns that it would have been misused. It was just after its development that Dall-e mini was created by Boris Dayma during a Hugging Face and Google hackathon in July 2021. This technology, due to its open-source nature and "after some recent improvements and a few viral tweets, its ability to crudely sketch all manner of surreal, hilarious, and even nightmarish visions suddenly became meme magic".[8]

[8](Knight,2022)

The DALL-E mini, even though all its limitations, enabled the text-to-image to be accessible to every user, becoming a viral phenomenon. This underlined that society was widely ready to accept an AI image creation tool.

‹fig.3
Darth Vader having tea with Pingu, @bromaggio via Twitter,July 2022

[8] Knight, W. (2022) "DALL—E mini is the internet's favorite AI meme machine," Wired, 27 June. Available at: https://www.wired.com/story/dalle—ai—meme—machine/ (Accessed: April 8, 2023).

It has also raised the ethical issue of how these photorealistic images AI generated can impact society and "the uncertainties about their possible impact"[9], as commented by a Wired article on June 2022.

[9](Knight,2022)

DALL-E then evolved in April 2022 into DALL-E 2, a more advanced version, that contrary to the first version, had its restrictions at its launch but became easily accessible without the waiting list later on.

This was induced also by the development of other models such as Google Imagen at first, and the boom of Midjourney right after.
Since the moment which Dall-e mini became available, there have been sparking great debates about the impact of these images and their ethics, the power of AI, and the implementation of these technologies inthe creative sector

1.1.c Accessibility of creativity and and fear of AI

Everyone is called into creation and expression and a larger community of creative people is crowding the sector. However, even though it has been widely accepted outside the creative environment, it is still under debate especially from the creatives themselves for different reasons. Some of the concerns come from the nature of the diffusion models since they are based on already created images and referenced styles and works which can be easily recalled in a prompt. But this debate is possible to overcome, especially if we consider that machines could be able to create styled images, objects, and pictures, but behind these, there's always a

defined prompt that has been written by somebody, and that creativity in its essence has always been guided by style and references. All this information also before generative AI has always been available in archives, but accessed differently.

The biggest and most common fear is instead the potential ability of AI to substitute humans and their faculties also in the creative sector, which is for instance the less algorithmic role of the human being. The introduction of machines that enable creative work, and the debate over the ethicality of this implementation had been the central theme of many past innovations, such as photography in the 19th century. At the time it was believed that the introduction of a machine that could faithfully reproduce reality would be the end for the role of the painter and painting in general, as this practice had the role of representing real life as accurately as possible, with extreme realism as a focus.

> Instead, the advent of a machine that could depict easily every detail of reality, on one hand, freed the painter of the obligation of high-fidelity paintings, and on the other hand, supported him in representing reality even more in detail.

The result was that more opportunities opened up, and another type of art, more emotional and abstract (such as impressionism) and hyper-realistic, such as Canaletto's. Between the 19th and the 20th century, there has been a reinvention of the role of the painter, a shift in what he was expected to produce.

Art became accessible both to the higher and the lower classes, and for this reason, is from this period that also poor families started to have family portraits done in a short time for an affordable price.

It was only later that photography as a type of art was accepted, giving rise to a considered art practice. Thus, it can be said that photography did not replace painting, but stood in support of and in parallel with this practice.

1.1.d The human creativity replacement issue

One can say that it is easy to see the similarity between what happened with photography in the past and what is happening today with artificial intelligence. But then again, the fear that arose in the past and arises today has a different nuance anyway, given the nature of AI.
When we talk about artificial intelligence we are implicitly assuming that the entity we are dealing with – and which is supposed to support human work – is an intelligent being.
By stating this, we are assuming that this being is capable of reasoning and imagining autonomously, attributes that we are used to seeing belonging to humans, and for this reason, being able to substitute man in its faculties.
However, the machine "[..] has no will in and of itself, and the direction that the machine follows is the direction that the human creator had inscribed in it at a certain point in its historical evolution.

This direction has been inscribed in such a form that it is acting as a gestalt that became unavoidable when it was turned into a tangle, but human consciousness is able to disentangle the mental activity from the limits and the traps of the gestalt."[10]

[10](Berardi,2020)

[10,11] Berardi, F. (2020) Futurability: The age of impotence and the horizon of possibility. London, England: Verso Books.

Thus, whether humans are capable of managing this complexity by escaping their own rules, machines result to be limited in being forced to follow a direction because of their algorithmic nature, and this is the reason why AI cannot fully replace human creativity.

> Moreover, what helps, most of the time, to disentangle the "traps of the gestalt" is the humans imperfection.

This characteristic is unique in humans and adds another reason to the topic. Because of our imperfect nature, the machine will never answer perfectly enough. Indeed, as Franco Berardi stated, "the perfection of the machine is the reason for its inadequacy to encompass the full infinity of imperfection."[11]

[11](Berardi,2020)

1.1.e The need for human creativity and to define a role for AI

According to what was explored earlier, it is necessary to emphasize how it is not AI itself that is the matter, but rather with what purpose it is applied in creative fields.

> AI is intended as an entity that is built to support human faculties, but as with any technology, it can substitute man as long as human enables this to happen.

For this reason, I would like to explore how this technology can be a support for creatives and why its implementation should be just a support of human faculties. Moreover, I will explain more in detail what implies its integration.

Since the generative AI – and in this specific case text-to-image diffusion models – are trained on already produced elements, thinking about applying this technology in the early stages of the creative process can be powerful. This operation is meaningful in the design process as long as it supports lateral thinking -- for instance if the generated outputs are used as starting points for the design practice. Generative AI should welcome "chance intrusions, irrelevance, and ambiguity to provoke different patterns and create new ideas (Bono,1979)."[12]

Moreover, it should support synectics, "the joining together of different and apparently irrelevant elements."[13] It is thus human's job to break out of the traps of gestalt to create innovation. This has nothing to be a surprise since this process of welcoming inspiration is already happening today by accessing databases of images (e.g. Google images or Pinterest). Humans are capable to create a personal narrative starting from given visions and I assume that this is what will make a difference in the future of the creative sector, especially now that creatives are getting into a convergent ideation phase. We can say at this point that, ...

[13] (Gordon, 1961 as cited in Mothersill and Bove, 2019)

analogously with the shift from photorealism towards

... in the era of generative AI, the difference can be made in the way a designer can add personal value while approaching a project once he is freed from creative limitations, ...

impressionism once photography had been integrated in art.
Its implementation must necessarily be done also considering other several factors, but in particular, the type of data that is included in the database in

[12,13] Mothersill, P. and Bove, V. M. (2019) "Beyond Average Tools. On the use of 'dumb' computation and purposeful ambiguity to enhance the creative process," The design journal, 22(sup1), pp. 1147–1161. doi: 10.1080/14606925.2019.1594981.

which the artificial intelligence retrieves information. According to the health data report 2022 "more than half of the datasets used for AI performance benchmarking across more than 26,000 research papers were from just 12 elite institutions and tech companies in the United States, Germany, and Hong Kong (China)."[14] This means that "the discourse about how AI should be used — and who should benefit from it — is currently heavily weighted toward people and institutions who already wield tremendous power over the internet (and the world)."[15]
Looking at the map representing this inequality the

If we consider that these data are used also to create texts and images, we won't be surprised by knowing that software that "reflects words and images that skew English, American, white, and for the male gaze".[16] (fig.4)

[14] (Facts and figures about AI, 2022)

[15] (Facts and figures about AI, 2022)

[16] (Facts and figures about AI, 2022)
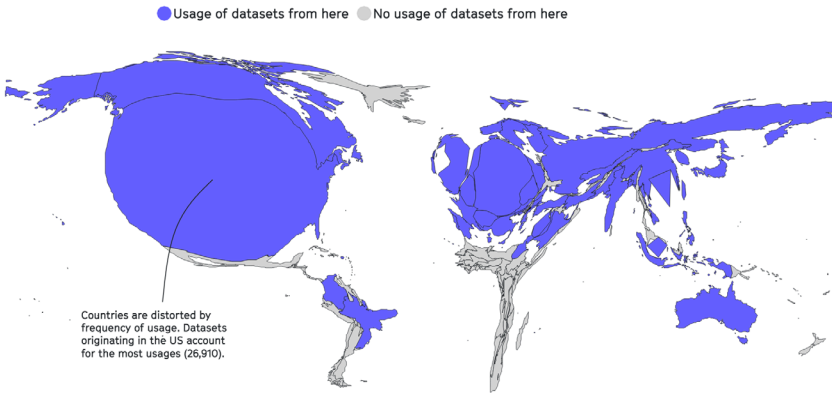
‹fig.4
Dataset map by Reduced, Reused and Recycled: The Life of a Dataset in Machine Learning Research, Bernard Koch, Emily Denton, Alex Hanna, Jacob G. Foster, 2021 as reported in Internet Health Report 2022

● Usage of datasets from here ● No usage of datasets from here

Countries are distorted by frequency of usage. Datasets originating in the US account for the most usages (26,910).

ⓘ This map shows how often 1,933 datasets were used (43,140 times) for performance benchmarking across 26,535 different research papers from 2015 to 2020.

[14–16] Facts and figures about AI (2022) The Internet Health Report 2022. Available at: https://2022.internethealthreport.org/facts/ (Accessed: April 7, 2023).

evidence is clear. From this consideration, while designing with AI and for AI, we might take into account how these technologies are limited to the information and knowledge of an unbalanced portion of the world. Relying on technology alone could lead to an even more distorted world, AI must thus be used by minds that can interpret the outputs.

The premises above about the advent of Generative AI, its potentials and biases call for a more defined role of it in the creative sector.

It is necessary to explore opportunities in which it can be used in a divergent and sustainable way, somehow avoiding its risks and to support human expression and creative potential.

Envisioning as a tool for foresight

2.1.a Need for narrative and envisioning to deal with dynamic reality

The theme of change, which characterizes the dynamic nature of the reality in which we live, is an issue that touches all sectors directly. The futurist Roberto Poli makes an interesting exploration of how these changes are out of scale and constantly accelerating in his book "Working with the Future. Ideas and Tools to Gover Uncertainty", talking about an approach toward future studies that is needed. He also explains how this approach is necessary not to predict the future, but to learn to deal with uncertainties.[17]

[17] (Poli, 2019)

We need to train flexibility to imagine the future and how this could be, to identify issues as well as opportunities in order to be prepared. Being flexible in a futuristic optic means enabling us to unlock possibilities to explore by envisioning them. In this sense, we must also be prepared ethically, for instance, "if I see what might happen, I have to take responsibility for what I will do or not do."[18]

It is thus necessary to create narrations and support the envisioning process. Alongside what was said before the speculative architect De Ostos, explains also how the narrative is an enabler to make this happen in a reality like ours. For instance, he writes: "We understand fiction as a reality asset, enabling us to build environments in opposition to the silent and dominant idea that the urban places we inhabit are simply too rigid to accept change." De Ostos & Jackowski, unlikely Roberto Poli, while describing reality uses the expression "too rigid to accept change"[19] that is, however, another facet of the same medal.

[18] (Poli, 2019)

[19] (Ricardo De Ostos, 2017)

Reality is seen as a rigid and unbreakable system even though it is extremely dynamic in the way its changes are growing and accelerating. These disconnections between rigid and extremely dynamic loosen the faith in the future, which can be strengthened and rebuilt through narratives.

If we suppose that building stories can create meaning for uncontrollable events that are about to come, we

[17,18] Poli, R. (2019) Working with the future: Ideas and tools to govern uncertainty. Bocconi University Press.

[19,20] Ricardo De Ostos, N. J. (2017) Scavengers & Other Creatures in Promised Lands. London, England: Architectural Association Publications.

can also consider that the reason behind this is that we can start considering having agency out of what is coming only if we start imagining it.

The architect defines the role of narratives as the "imaginative glue, the inventive connections and invisible structures that give sequence and meaning to disparate events before they are even accepted as facts."[20]

[20] (Ricardo De Ostos, 2017)

And then, as a process of grounding the narration, what can be associated with "anticipation", is "the way we translate models into decisions and actions."[17] Considering identifying more stories of the future can open up many more alternatives from which to choose, and it is only from a variety that it is possible to choose. The choice itself is not a solution for the future yet to be since reality is not made of problems and solutions, but a way to deal with its complexity. Franco Berardi in his book "Futurability" explores this topic in an interesting way as expressed in the passage below.

Social evolution can be described as the succession of insolvable conundrums, emerging possibilities, vibrational oscillations, and finally selection and enforcement of one possibility among many: a provisional solution that neither solves nor stabilizes the infinite complexity of the conjunctive life. I call power the temporary condition of implementation of a selection among many possibilities. I call power a regime of visibility and invisibility: the exclusion of different possible concatenations from the space of visibility. A form emerges from many possible forms, then it turns into a gestalt, a format of perception of the surrounding reality. The gestalt is a perceptual code: a form that generates forms. This is power.[21]

[21] (Berardi,2020)

[21] Berardi, F. (2020) Futurability: The age of impotence and the horizon of possibility. London, England: Verso Books.

Envisioning realities and opportunities becomes, at this point, a realistic answer to regaining faith and agency in this rigid and accelerating future that is still yet to come. It becomes also a reality multiplier of possible futures and mostly, the power is the ability to let one possibility emerge by generating others that shape another side of the same future.

2.1.b Storytelling and communication limits while envisioning

While working with forecasting and designing futures, the difficulty in imagining requires as much effort as the one in communicating it.

> And if it is real that imagining and communicating is difficult, it is even harder to find an alignment and cohesion between people's imaginations based on different images pictured in each mind.

This multi-layered complexity in envisioning futures elevates the role of conversation at the core of the design process. Conversation is not just the mere activity of talking, but it is, for instance, how we communicate our visions, the way we try to understand others and the way we build a common idea of the future. It is a way to support a holistic process.
However, enabling discussion has both positive and negative aspects. It leads to inspiration, understanding, and alignment as well as confusion, misunderstanding, and misalignment and for this reason, it can be frustrating and energy-demanding, especially when collaborating with different backgrounds and personalities. Moreover, not everybody is usually able to express themselves in

the same way, and there's always the probability of losing some aspects or visions because of a lack of communication with the risk that the more well-communicated idea is preferred instead of the others. This happens very often while designing futures since ideas are often described by shapes, scenes, and spaces that none could have ever seen before.

All these challenging dynamics that one can have to make this practice less accessible and, for instance, less distributed. Stuart Candy, one of the most relevant futurists for the topic affirmed that "The foresight field finds itself with much room for improving public uptake towards the fulfilment of what I consider to be its most important promise: the development of a distributed, society-wide capacity for anticipation."[22]

[22] (Candy, 2019)

Since the future is shared, it is necessary for these conversations about the future to become as inclusive as possible, with open and moderated discussions that support each member in his expression and understanding.

The futures literacy itself, as Candy explains, "is lacking from most people's experience, even in core social institutions where we might hope to find it well established, such as education, politics, and the media."[23] and working on its accessibility is a necessary step to make its knowledge more widespread.

[23] (Candy, 2019)

To enable this to happen it is thus required to mature literacy in imagination expression.

[22,23] Candy S.(2019) "Gaming Futures Literacy" in Miller, R. (ed.) (2019) Transforming the future: Anticipation in the 21st century. London, England: Routledge.

At this point, one can say that also the designer himself should facilitate this process of engagement through imagination expression literacy. An explanation comes from Paul Pangaro, a scholar at Carnegie Mellon University who has largely explored the topic of cybernetics and design for conversation. He explains how "the designer's main challenge is to understand the situation, its constituents, and their context, and from that understanding help facilitate agreement on shared goals."[24] By talking about the holistic process of formulating (and reformulating) a goal (that in our case is the definition of a future scenario) he said that …

[24](Dubberly and Pangaro, 2019)

> the designer "proceeds not only by explicit discussion of possible goals, but also by making artifacts related to the possible goals. [...] Designing requires making goals explicit, otherwise they cannot be examined, critiqued, or improved."[25]

[25](Dubberly and Pangaro, 2019)

Thus we see that there's a relation between artifacts and goals enabled by a conversation that helps in formulating and constantly reformulating the goals. For instance, in order to make the conversation inclusive, the designer's action should support the production of artifacts related to the foreseen scenario.

2.1.c The Thing from the Future and the Cover Story

An interesting case study for conversational artifacts is the game "The Thing from the Future" by Situation Lab. This card game has been designed to stimulate

[24, 25] Dubberly, H. and Pangaro, P. (2019) "Cybernetics and Design: Conversations for Action," in Design Research Foundations. Cham: Springer International Publishing, pp. 85–99.

each of the participants in thinking about an artifact that could be representative of a given scenario. The dynamics are pretty simple, "In a small group, usually three to five people, players cocreate a prompt and are each challenged to describe an artefact from the future which meets the parameters. Any prompt offers the necessary constraints for one to describe a specific cultural fragment from a possible future".[26] The game can be also competitive, where the best card is chosen as the winner of the round. The game itself is very flexible in the way it can be used, it could be an icebreaker as well as a structured exploration.[27]

[26] (Candy, 2019)

[27] (Candy, 2019)

This Thing from the Future is very interesting in different aspects, for example, the ability to stimulate imagination by prompting through variables;

participants feel freer to imagine since a given structure supports each one in creating a vision. Another point is that the given and moderated enables each participant to feel uninhibited in communicating his or her own idea - albeit a crazy one - of the future, making this process more participatory. As explained by Candy who worked on the project, "None of this is to suggest that the game replaces proper scenario generation processes, but it might be a way to make some of the distinctive modes of thinking involved less intimidating and therefore more common."[28] Therefore, it is a clear example of how artifact production and storytelling could lead to conversation, and so to a more inclusive and distributed design futures literacy.

[28] (Candy, 2019)

[26-28] Candy S.(2019) "Gaming Futures Literacy" in Miller, R. (ed.) (2019) Transforming the future: Anticipation in the 21st century. London, England: Routledge.

And if it is true that artifacts and their narration are enablers for conversations, in futures thinking they acquire even more value.

Whoever is involved should indeed narrate something that does not have a shape yet, but has clear dynamics that can be told through a story or an artifact. The result is that different tools support the storytelling frameworks throughout the foresight process, such as the "Cover Story", used in support of the visioning and narration of a scenario.

This tool has been designed and interpreted in many ways, but in its most common shape, it is a mockup of a magazine/newspaper cover in which the participants could insert a piece of written news and a cover picture from the future. This visual aid helps to create a tangible representation of the story, making it easier for others to understand and connect with the narrative.

The Cover Story mixes the image and its narration to help in communicating a future as its whole, by representing reality as a fact.

It is for sure a medium through which is possible to

ideate a systemic and cohesive vision of the future. The narrative allows for connecting the dots of the various facets of the future in a tangible way, that can be communicated and understood through immersion.

What is compelling in the Cover Story is the structure of the news – made of images and text – is used to create a solid and cohesive narration as a result of a group envisioning process.

The tangibility of system dynamics becomes understandable and immersive through an artifact. In both "The Thing from the Future" and the "Cover Story", …

… it is undoubtedly relevant the role of storytelling and the use of artifacts as immersive and conversational tools: while the former is supporting the individual idea, the latter supports the narration of a whole cohesive scenario.

The goal of this thesis is to investigate the integration of these two aspects of scenario visioning into a single toolkit to facilitate a participated creation, conversation, and an effective scenario narration.

AI and envisioning: Designing for the future with AI as medium for visualization

2.2.a The power of text and image

The Cover Story was a clear demonstration of how the mix of images and text can help in supporting the definition of a vision-stimulating conversation and how, at the same time, they can be very powerful in creating a vision of a possible future by opening alternatives. Both images and text are extremely effective as vision transfer but even more so when they are combined. Together, they support each other in building a clear idea of something that doesn't exist yet: images can picture a vision while stories can give coherence to certain dynamics. However, the old saying that "a picture is worth a thousand words" and this is undoubtedly true, in particular when time is limited. The image itself has the special power to arrive directly to the observer at very first sight, which is something essential, especially when dealing with a dynamic design process – such as the early stages – that requires being responsive in a short time.

Another interesting aspect is that the image also has the power to leave uncertainties as unpictured reality assets, which can be fulfilled by the imagination to find personal coherence, but they are not needed to be told.

Because of this tangible value of freeing the imagination, representations are a very powerful means of communicating the invisible too. An example is the interesting story of "The Great Ngurrara Canvas".
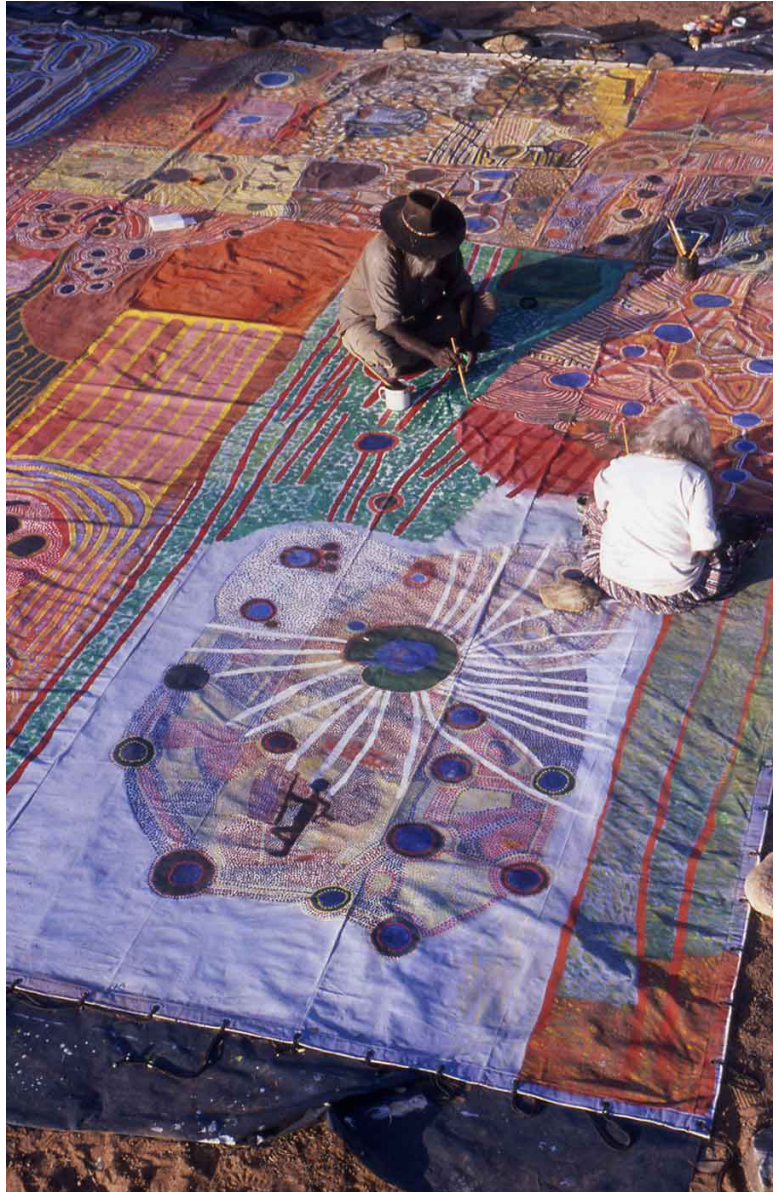
>fig.6
Hitler Pamba and
Nada Rawlins
completing the
Warla section of
the Ngurrara Canvas
at Pirnini,Dayman
1997

This enormous canvas (eight by ten meters) was
painted by over 60 aboriginal artists and claimants,
coordinated by Mangkaja Arts Resource Agency
to claim the evidence of the ancestral, social, and
economic connection of the Southern Kimberly
Community to the Great Sandy Desert of northern
Western Australia. This painting is a bird-eye view
with all its details. "The waterholes, trees, salt lakes,
and people are visible. It shows the path of serpents
and ancestors. It tells a panoramic story of ceremonies
being performed, creation stories, of spirits, of snoring
fathers."[29]

[29](Tech,2008)

<fig.7
Ngurrara artists
producing Ngurrara
Canvas II at
Pirnini, photo by
K. Dayman, 1997

This painting was presented to the court in 1997, by
an idea of Ngarralja Tommy May who explained:

"…we were wondering how to tell the
court about our country. I said then if
kartiya [Europeans] can't believe our
word, they can look at our painting.
It all says the same thing. We got the
idea of using our paintings in court as
evidence."[30]

[30](Tech,2008)

However, this representation was the second attempt to represent it. The first one was painted one year prior, but since artists worked independently on different parts, they resulted in unmatched scale and unmatchable panels. On their second attempt, they opted for a larger canvas having learned how the different elements should work together. This story ended happily, with the recognition of the land of over 76,000 square kilometers in exclusive possession of the native.[31]

[31] (Tech,2008)

What is very interesting about this case is how representations can demonstrate evidence not just by showing, but by tangibly stimulating our imagination to believe in something intangible through artifacts.

Moreover, it is even more evident that working simultaneously in representing something that does not exist is necessary to align all the personal visions of the same element for a cohesive representation.

The representation has then such power also for scenario visioning, considering the intangibility of scenarios, the need for participated foresight, and the fast communication in the early stages of the process such as the brainstorming around this phase of the process.

Nevertheless, the power of image alone cannot substitute for the narrative, that can guarantee the effectiveness in understanding especially when mixed with images and used as the envisioning output (e.g. the Cover Story).

[29-31] Tech, A. A. D. (2008) Ngurrara: The great sandy desert canvas, Aboriginal Art Directory. Available at: https://aboriginalartdirectory.com/ngurrara-the-great-sandy-desert-canvas-2/ (Accessed: April 7, 2023).

2.2.b Exemplification of how
AI can be crucial

> "Envisioning is also part of the narrative process. To envision is to give form to an idea, to make a decision on how a vision will take shape - whether in the built realm or on paper."[32]

From this statement by De Ostos, one can say: And what if we use AI-generated images to support the envisioning process as an imagination transfer? And that's where a new possibility emerges.
It is interesting imagining a connection between the text-to-image diffusion models and text and images in the context of storytelling. Moreover, if we consider images as the artifacts that can trigger a conversation during the scenario envisioning process, leading to the definition of a narration.
The use of ai would be, at this point, crucial for different reasons.

>1
AI is a functional and accessible tool to visualize the future.
Firstly, AI with its structured prompting process can create a common ground for all the participants in the scenario envisioning session, a framework that can support each member in expressing themselves and giving voice to their visions in the same way. And for instance, this is where we are making the futures thinking process more accessible and distributed. Everybody can have the opportunity to express their ideas in the same language, which is also the idea behind the game "The Thing from the Future" by Situation Lab.

[32] Ricardo De Ostos, N. J. (2017) Scavengers & Other Creatures in Promised Lands. London, England: Architectural Association Publications.

>2
Fastness in image generation.
Secondly, AI can help in rapidly translating imagination to reality by producing a visible artifact that can be easily understood. In this way it enables a moderated conversation without misunderstandings thanks to the production of a very powerful medium, easing the conversation and so, the process.

>3
Flexibility, supports fast changes.
Thirdly, the AI prompting structure allows quick variable changes, and so quick variations of artifacts with amazing results, leaving more time for meaningful discussion and less time for creation, which is often frustrating. And if the first phase of the design process is lacking computational support because of a lack of flexibility, Generative AI can be the decisive technology.
Human imagination can be finally easily pictured and explained through an efficient and tangible medium.

This opens a new role for AI, different from the ones that it has assumed to have: AI is an enabler, a supporter, and a tool to let humans imagine and converse easily.

A bridge between AI and envisioning should be created to support human beings in their work, in particular in triggering a moderated conversation, which is the key to designing for the future.
For instance, AI will generate outputs according to our inputs, which we will elaborate on and use to trigger a human-human conversation to design a better future.

2.2.c Design for conversation:
Exploratory possibilities

By affirming that artificial intelligence is a tool to support humans in the conversation to design, we are understating that the human-machine conversation is not a real conversation.
An exhaustive explanation of the topic is given by Paul Pangaro – professor at Carnegie Mellon and President of the American Society for Cybernetics -- during his talk at the undergraduate class "Critical topics: AI Images", delivered for Bradley University in Spring 2023 by Eryk Salvaggio.

> Pangaro states that talking with GPT3 is an apparent conversation, in that " [...] you have a conversation between two different perspectives, which is helping you to generate, but that's you and you, not you and GPT3."[33]

[33](Pangaro, 2023)

He further extends the answer when he talks about the topic of the text-to-image Generative AI, and the consideration raised by Eryc Selvaggio about the presence of an actual conversation, since the ability of the technology to enables changes and the generation of variants. He explains that these tools help you to converge or, at least, get closer to somewhat your intention, however, the result will always be different. This process of image refinement, even if the granularity of the manipulation increases, will still be an acceptance or a rejection since you are not interacting about what is it about, but about the changes to apply.[34]

[34](Pangaro, 2023)

Generative AI won't be at this point conversating, but somehow co-designing by offering simply alternatives.

[33,34,37] Salvaggio, E. (2023) AI Images, Class 3: Guest Lecture, Paul Pangaro. Youtube. Available at: https://www.youtube.com/watch?v=UMW6Q0wS7qY (Accessed: April 7, 2023).
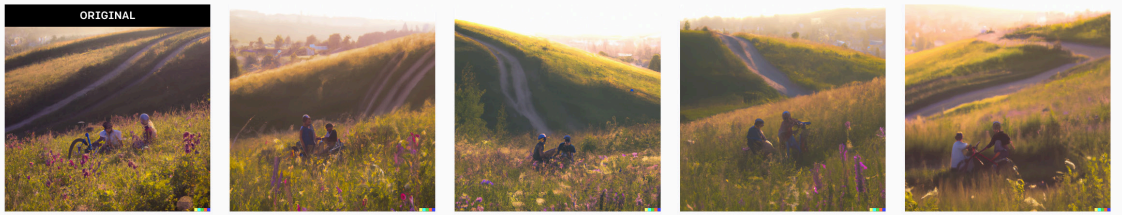
>fig.8
Variations of the
prompt "Two young
people with a bike
sitting on a hill
full or lillac
flowers, warm and
soft atmosphere,
dreamy." generated
with DALL—E2, 2023

By changing the prompt and scrolling through alternatives we are just watching the possible choices of each variable, but we are not investigating, for example, why a choice was made.

In these terms, we cannot consider the human-to-machine interaction as a real conversation, ...

... which it can, instead, enable what Paul Pangaro defines as second-order design or "design for conversation" that is "the design of situations in which others can create, that is, the design of platforms, including languages."[35]
This second-order design is becoming essential for our society. "We see design-for-conversation as the emergent space of design for the 21st century and aim for it as our goal. [...]

[35] (Dubberly and Pangaro, 2019)

The goal of second-order design is to facilitate the emergence of conditions in which others can design – to create conditions in which conversations can emerge – and thus to increase the number of choices for all."[36]

[36] (Dubberly and Pangaro, 2019)

[35,36,38] Dubberly, H. and Pangaro, P. (2019) "Cybernetics and Design: Conversations for Action," in Design Research Foundations. Cham: Springer International Publishing, pp. 85—99.

By saying this, we mean that AI can support the second-order design and it is essential to create the conditions to have choices to converse on and from where we can build meaning. We can therefore realize the 4th of the Paskian interaction principles, designed by Gordon Pask, who explored the topic of cybernetic serendipity.

This fourth point claims the "conversation for design", where "The Architecture Machine proposes a human-computer conversation for a design where machine and human co-participate in evolving goals as well as means (methods)."[37]

[37](Pangaro, 2023)

Designers should then also evolve the methods themselves, to integrate these conversations while designing because in 21st-century society it is necessary to work on shared goals, and discussions are necessary to enable its construction. The reason why we should rely on the conversation is again explained by Pangaro.

"Conversation is required in order to converge on shared goals. To share goals is to agree on (re)framing a situation in order to act together."[38]

[38](Dubberly and Pangaro, 2019)

It is important to reason about all the considerations around AI and its new role, especially by considering adding a level of human-to-human conversation over the human-to-machine interaction, with the purpose to make the conversation valuable for the practice of social foresight.

Therefore the thesis will work with AI as an enabler, a translator of human imagination through artifacts. It will be created a collective narration through a human-to-human conversation that starts from a human-to-machine interaction.

Tool dynamics and prototyping sessions

The ideation process

3.1.a Prompting: the language of the machine: Empathy Writer by IDEO case study.

Oracolo's idea is born by reasoning around how the text-to-image could have been an imagination transfer for a group of participants involved in the envisioning process. This topic has called for research into the way we communicate with the machine itself, in particular, starting from the concept that if everybody could have been able to communicate with AI, everybody could have been an active participant in designing futures.

> The project has been pivoting around the core idea that by improving the input, the output would have be improved too. For instance, the concept that by improving the quality of the text, the image results in a higher quality and, as a consequence, it could have eased the communication among the participants.

Therefore, important research of this thesis has been done around prompt generation, where "prompting" is intended for the action of crafting specific inputs that guide AI towards specific tasks. Currently, the development of Generative AI has led to a growing request in the market for this "prompting skill". "The latter skill has become known as "prompt engineering": the technique of framing one's instructions in terms most clearly understood by the

[1] (Bridle,2023)

system, so it returns the results that most closely match expectations – or perhaps exceed them." reports The Guardian.[1]

Also, Professor Erik Brynjolfsson, Director of the Digital Economy Lab at Stanford University, told the audience at Davos 2023 that "Right now, it would be downright dangerous to use [generative AI programmes] without having a human in the loop, but I think even going forward we are going to develop a new job, the job of prompt engineering."[2]

[2] (Brynjolfsson as cited by Whiting, 2023)

And this is true since it is essential to create literacy around the prompting topic, however, it is also true that it is as important for literate creators to give meaning to the input prompted by the machine.

By saying this I mean that the input is not limited to the mere way through which we communicate with the machine but has to do also with the quality of the content that we are generating, and so, the formulation of a reason behind our request.

Working on the input to increase the quality of the output carries all this kind of reasoning behind it.

The prompt itself can be composed of two elements, one is the content of the request, and the other is the language, the way the machine wants us to communicate it. Both of them are crucial to generate outputs that matter with the best quality expected. To better understand this distinction, an explanation through we will analyze an interesting case of a speculative design object. This design case is called

[1] Bridle, J. (2023) "The stupidity of AI," The guardian, 16 March. Available at: https://www.theguardian.com/technology/2023/mar/16/the-stupidity-of-ai-artificial-intelligence-dall-e-chatgpt (Accessed: April 7, 2023).

[2] Whiting, K. (2023) 3 new and emerging jobs you can get hired for this year, World Economic Forum. Available at: https://www.weforum.org/agenda/2023/03/new-emerging-jobs-work-skills/ (Accessed: April 7, 2023).

"Empathy Writer" and was designed in 2018 by IDEO as part of the "Hyperhuman" exhibition, where five working prototypes of machines were presented as an exploration of how clever machines' will help us to accelerate to a more meaningful society in a near-future. Empathy writer is a typewriter designed to write letters without losing in translation empathy. This machine has integrated the possibility to express the traits that better represent the emotional state of the sender and of the recipient, which is then elaborated by AI. The result is a letter – in the format of a receipt – with the correct tone of voice for the recipient but also with the intent and mood of the sender.The interaction with the object is very simple: the sender writes a letter by typing the message on the keyboard, and the machine detects emotions through the placement of some cards in special slots, shows anticipation of the elaboration on the screen, and generates a receipt.[3]
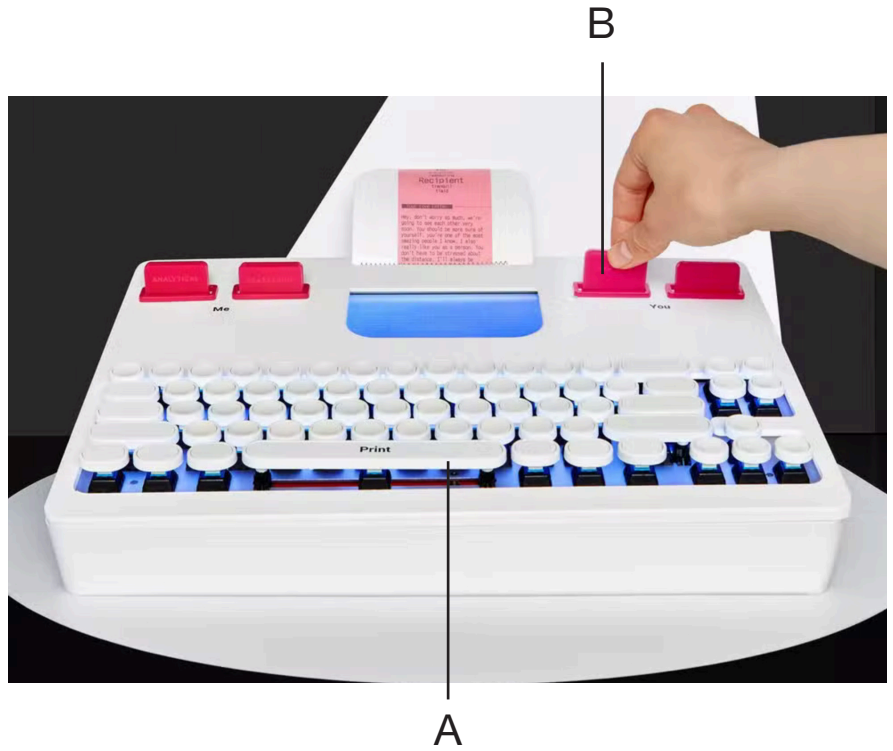
[3] (Dean Malmgren & Jure Martinec, 2018)

<fig.8
The feeling cards, as filters of the written text.

<fig.9
The receipt as result of the AI machining.

[3] Malmgren D., Martinec J.,(2018) "What the AI products of tomorrow might look like", IDEO. Available at: https://www.ideo.com/blog/what-the-ai-products-of-to-morrow-might-look-like (Accessed: April 7, 2023).

B

A

This object works with two inputs, machine intelligence, and an output. The first input is the content of the mail, written on the typewriter keyboard (A), while the second one is the filter through which we want to express it, that is the cards (B).(fig.10)
While reasoning about the inputs we can observe that It is only by both writing the content and inserting the cards that we can get an elaborated output.

For instance, we cannot expect to have an output by just placing the cards or by just typing a text, but it is the mix of the two that can give the ingredients the machine needs to elaborate it.

Analogously, the moment we start prompting a machine we cannot expect to get a good result by only knowing the language of the machine (B), but we also need to be creative and effective in the content we are writing (A). It is only by building an idea and then establishing effective communication with the machine that AI can release its potential and that the user can take advantage of it.

Thus, for this thesis, both types of input will be considered to get qualitative results.

3.1.b Inputs: communicating with the machine and creating content

>A
Communicating with the machine. Disentangling AI prompting structure to gain agency over AI.

Talking about the way we communicate with the machine, it is interesting to reason around how the ability to manage its variables can help in gaining somewhat agency over AI. A machine is scary until you understand its algorithm, so agreeing with what Paul Pangaro stated, "What I want is a machine where I have agency, and that agency requires honesty and transparency on the part of the algorithms."[4]

[4](Pangaro, 2023)

Of course, by knowing the correct language by which we can communicate with a text-to-image diffusion model we are not pretending to understand its darkest algorithms, but we can for sure get closer to knowing in a more clear way how to manage its potential.

[4] Salvaggio, E. (2023) AI Images, Class 3: Guest Lecture, Paul Pangaro. Youtube. Available at: https://www.youtube.com/watch?v=UMW6Q0wS7qY (Accessed: April 7, 2023).

For instance, if we assume that we know what we are managing, it means that we are conscious of what is possible to do, thus we are somewhat exercising agency over AI. In this way, it can help us in feeling more confident, and we can get better results since we are treating it more as a tool than as a scary entity. Considering, as previously mentioned, that "human consciousness is able to disentangle the mental activity from the limits and the traps of the gestalt."[5]

[5](Berardi,2020)

So, as AI consumers, we must be able to untangle its variables from the traps of the gestalt. Once the structure is more accessible and clear, understand how to manage it, and work both with its power and its limitations.

Gaining agency over AI means then also taking account of the nature of the data, (as their biases, for example), and further building meaning over what has been generated, elaborating and conversating.

>B
Creating content. The machine structure as a imagination stimulation

The disentanglement of AI schemes is not enough to design better futures through picturing our imagination. As we mentioned before, a good input, to obtain a good output, should also be focused on the creation of the quality of content that we are going to generate.

Sometimes it is quite difficult, especially while talking about future scenarios, systemically build coherence between the different elements of the future imagined.

It is therefore difficult to imagine with extreme accuracy what a scenario with clear dynamics might look like, even if its vision could help in narrating it.

Here it was interesting to see how the structure of prompting itself can be supportive in overcoming this obstacle.

The machine itself was built by man in a very rational way, providing parameters and variables. It is interesting to see how the term "variables", even if belonging to the computational language, has been often used while talking about design. "Gero (1990) in particular uses language familiar to the computational world when he writes that ...

... designing "can be modeled using variables and decisions made about what values should be taken by these variables."[6]

[6](Mothersill and Bove, 2017)

Computation and design are relatable to the way this structured way of thinking can support ideation. These patterns, while they may seem highly elaborate, make it possible to provide constraints that facilitate the grounding of the imagination. Thus, the structural nature of prompting is nothing more than a tool to stimulate the imagination in working out responses to different aspects of a visual, to ensure that an image of it is constructed as it is imagined.

This design methodology is similar, albeit with differences, to that of "The Thing from the Future" game, where constraints are the enablers of imagination stimulation. In the research report of the game, Stuart Candy indeed writes: "Each prompt is a different set of "enabling constraints" (Hayles, 2001), and the limits that confine and

[4,8] Mothersill, P. and Bove, V. M., Jr (2017) "Humans, machines and the design process. Exploring the role of computation in the early phases of creation," The design journal, 20(sup1), pp. S3899–S3913. doi: 10.1080/14606925.2017.1352892.

challenge the imagination in each round of gameplay present a pathway disclosing potentially brand-new vistas unimaginable until one ventures along it. As the game's co-designer has observed, "Limitations don't just inspire creative solutions to problems: rather, they are necessary to them."[7]

This is what also Oracolo works on, building an artifact while passing through constraints. However, there is a fundamental difference in the concept: whereas in the "Thing from the Future" cards (as predefined variables) are delivered and based on the sum of these predefined stimuli a concept is generated, in Oracolo – and so in text-to-image prompting – the boundaries are the prompt variables, the compilation of which allows the construction of both an idea (for each variable) and an image (as the sum of these). In this case, though, it is the AI that adds up the various aspects and gives them form.

Hence, the rationality of the machine can be supportive of human imagination as a stimulus for its scenario envisioning and picturing.

Nevertheless, it would be wrong and limiting to rely solely on the stimulus generated by prompting for the creation of a coherent vision of the future. This is where the need for dialogue among participants comes in, where discussion can generate and elicit further facets of the same vision. Philippa Mothersill and Michael Bove Junior have discussed this aspect in their research about the integration of computation in the design process. They state that: "To generate truly paradigm-shifting 'creative' designs, this exploration relies on "the introduction of new variables into the design process, variables which were not originally considered by the designer or design system" (Gero,

[7] (Watson,2012, as cited in Candy, 2019)

[7] Candy S.(2019) "Gaming Futures Literacy" in Miller, R. (ed.) (2019) Transforming the future: Anticipation in the 21st century. London, England: Routledge.

1990). Such new variables can be found in many ways: reinterpreting the existing design by mutating its features, reframing it by considering analogies several levels of abstraction away from the original context, recombining ideas in surprising new ways to create a new requirement, or from first principles (Gero & Maher, 1993; Minissale, 2013; Schön, 1983)."[8]

[8](Mothersill and Bove, 2017)

This "mutation of features", "analogies in abstraction" and "ideas recombination" is exactly what happens in Oracolo in the second phase of envisioning, when participants are required to share their ideas through their artifacts and start building a narration of the group vision.

In the comparison and conversation creativity can again be stimulated by observing other people's artifacts, supporting the generation of new details of the same vision (around which a story will be created). The other outputs thus become the new "variables" of our image, being precisely a representation of the same reality created from a different point of view.

3.1.c Analysis of the best AI platform: Midjourney

Nowadays there are different types of text-to-image diffusion model platforms we can rely on, and each of them, despite being structured similarly, has peculiarities that differentiate them from the others. As a result, when stating that the project will focus on exploring prompting and prompt variables, it has been incumbent to first specify what platform – and thus

what language – we are talking about. The design has then been guided by the exploration of its prompting system.

The choice of platform was dictated by the evaluation and comparison of several features among the most popular diffusion models. Dalle-2, Midjourney, and Stable Diffusion.

As far as now, since the explosion of Generative AI platforms, these have been demonstrated to be the most relevant for image creation so far.
The differences between these platforms are compared by the parameters of accessibility, expected result and target. They have been evaluated though personal testing, community feedback and informations gathered during the "Prompt, chi Parla?" Prompt designing lectures held by Jacopo Perfetti and Federico Favot in February 2023.

>fig.11
Platforms outputs
in comparison by
prompting "A render
of an autronamut
walking into the
Death Valley, 8
Sigma 85mm lens
f1/4, photography,
ultra details,
natural light,
with mutued color
background.".
Perfetti,Favot;
February 2023.

DALL-E 2

Stable Diffusion 1.5 (via PromptHero)

Midjourney

>DALLE-2

Accessibility: easy to use, paid service (15 credits for free per month)

Dall-e 2 is perfectly accessible by anyone. Its interface is very simple and understandable, and it has ensured that this has been widely used from the beginning. To get access simply log in to OpenAI and type in the space bar that appears. Suggestions on how the prompt can be improved also appear below the bar, however, there is not much control over prompting since the interface is very simplified. The first 15 credits are for free (where credit is intended for the generation of one image or each image variation), but it is a paid service.

Expected result: high

There are not many variables to work with, thanks to AI the results on the image are however high (except for realistic images of people). The tendency of the images generated is photorealistic. Since August 2022 a new function, called "Outpainting" has been introduced. This function allows extending pictures by adding what could be pictured around. Since this new feature has been introduced, generated images are, however, never fully represented in the frame, which seems a choice to encourage people to extend it (and so, to use more credits).[9]

[9](Perfetti,2023)

target: beginners

>Stable diffusion

Accessibility: Open source technology, free (when on your computer), highly customizable.

[9] Jacopo Perfetti, F. F. (2023) "Prompt, chi parla?", lecture notes, 21 February 2023

The open-source nature of the tool allows its accessibility to everybody in the online version, even though it is not as accessible in terms of ease of installation on personal computers. Its high customization is a positive factor considering that it will be useful for the tool to be able to have direct control over the prompt variables.

Expected result: basic

The software generates 4 image variations from one prompt, but the quality of the output is still basic compared to the other models.

Target: developers

>Midjourney

Accessibility: non-immediate UX, paid service

Midjourney is a platform accessible through Discord. To generate images is necessary to interact with a bot that can be imported into a personal server (further the process will be explained more in detail) or into the general server. This interface is not immediate especially if it is the first time using Discord, but it is easily understandable as a platform once you start generating. Discord however could be considered a limitation as well as an opportunity since its structure can support group work and sharing.

Expected result: high

The software generates 4 image variations from one prompt, with high quality and a high understanding of the prompt. The style has a tendency to be fantasy, especially in the first versions, but it can also be extremely photorealistic when explicit. Midjourney can easily represent people in detail, and thanks to

the ease of managing the variables the results are very customizable.

Target: people who want to experiment more in detail

> After careful consideration of the various alternatives, the choice of platform fell on Midjourney, which proved to be the ideal choice on several fronts despite its limitations.

These will be analyzed later on to find a possible resolution in the context of usage. There have been different reasons for this platform choice, but it has been mostly led by considering the target expected to be using the tool and by the purpose of the tool. For instance, thinking of its accessibility according to the target – ...

> ... if this tool is used in institutions, companies, and especially by consulting firms – I believe that the accessibility aspect at the level of investment on the machine is not as relevant as its performance.

Rather, accessibility at the level of collaboration, which is strongly supported by the platform, is. Discord has several ways to support collaboration indeed, including servers where different people (e.g. belonging to the same teamwork) can have access, specific channels within servers (e.g. different projects or different types of communications), the ability to make video calls, access communities, third party

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[10] Librarian (2020), "Blog: come mettere Discord al servizio della vostra classe", Discord.com. Available at: https://support.discord.com/hc/it/articles/360041360311-Blog-Come-mettere-Discord-al-servizio-della-vostra-classe (Accessed: April 7, 2023).

applications support and so on.

The potential of the Discord platform, although not as accessible as Dalle-2 at first usage, is greater than the limitations encountered initially.

By now, Discord is mainly used for gaming but it is, for all intents and purposes, a platform for the simultaneous management of various working aspects. To make a comparison it could be associated with Slak, the digital platform for collaboration often adopted by companies. With the lockdown due to the 2020 pandemic, the application proved to be even more relevant given its flexibility on the coordination of different actions in the same platform.[10] Several institutions have begun to rely on it as a support for online classes, a trend that has developed over the years. By supporting this, I expect that the process of using Discord as a platform to produce images will not be a limitation, especially in the future, since it could be already installed by the participants on their computers or it could be, in the alternative, installed and easily integrated into the workflow from that moment on.

[10](Librarian,2020)

The use of Midjourney would require then just the transfer of the Midjourney bot into the personal server created ad hoc for generating images within a group inside a shared space.

Another reasoning should be done, of course, about the quality of the image required for the task. Because of the purpose of translating the imagination into an image, it is essential to be represented in detail and, as a consequence, that there be the possibility of working on multiple variables to achieve the desired result. The quality of the outputs produced by the machine is extremely elevated. It is capable of reproducing habitats, people, and objects with extreme

sophistication and detail, understanding them very well the prompts. By prompting an input in the chat box, the bot is called to produce 4 image variations, from which it is possible to generate other variations or alternatives to upscale the preferable one.

> The machine has also been designed for image refinement or detailing: by adding some parameters at the end of the prompt the image could evolve in many different ways.

It is indeed possible to mix pictures, enlarge them, remove elements, ponder the number of elements inside the same composition, abstract the picture, or even use the same machine seed of another AI-generated picture previously generated.
In addition, Midjourney is, as far as now and according to my research, the clearest platform in terms of what parameters are required to have a fully analyzed prompt. It is possible to play with variables and there is an enormous community that daily shares their results and prompts in the general channel. These are valuable sources for prompt design.

> It is exactly this freedom given in working with variables that easily increases the agency we can have over them, and so the stimulation of our content creation while writing which is essential, especially for all the premises we explored before.

3.1.d Variables analysis, synthesis process and game structure

The prompting variables selection has thus followed a logical process, by analyzing the Midjourney variables and parameters by first gathering and then clustering them under wider categories.

The identification of the variables was done based on different types of sources. Specifically, the information has been collected from the Midjourney guidelines, from well-structured sites regarding prompt generation (such as www.promptomania.com), and prompts generated by the Midjourney community. During the design process, these have been reorganized many times according to the prototyping test results and they have been integrated along the process with prompting guidelines that have become more and more and more reliable as time has passed. These include the integration of information on a prompt building acquired during the prompt design course "Prompt, chi parla?" in February 2023.

All this research helped me in identifying thirteen variables and a list of parameters that I have realized as a prototype of cards to visualize them better.(fig.12)

The gathered variables are image prompt, description, art medium, style, dimensionality, post-processing, geometry, color filter, material, mood and intangibles, lighting, camera, and display. As a side note, it is necessary to specify that the variables compared to the parameters are less obsolescent. Whereas the choice of the variables has been stable over time, the choice around the parameters has been done less arbitrarily, by following the most durable and functional parameters found during the evolution of the software.

During this research, we will therefore focus on the Midjourney variables collection process, rather than the parameters one.

Talking then exclusively about the variables, it was interesting to note how sometimes the results of some of these were very close to others, even though the prompts covered different domains. For instance, by prompting "high detail" in terms of the quality of the output, the result was quite similar to writing "octane", which refers instead to the material quality.

> I have hypothesized that the rapid evolution of technology would have solved the human-machine interaction somehow and therefore the need for following the language of the machine would have been obsolete over time.

Once all the thirteen variables have been defined, I proceeded towards a convergent phase, in which they have been aggregated under broader categories: subject, atmosphere, camera, mood, and image. These clusters could help in the schematization of a correct prompt building and so, a more clear prompting process.

As for the Midjourney variables selection, futures thinking variables were also initially analyzed and collected, and subsequently clustered.

> I found it essential to insert these factors into the process to keep linearity with the previous research and define a tangible line from the scenario definition to the scenario envisioning. The analysis had been done by considering 3 different Design Futures toolkits and activities and trying to understand which factors were essential in defining the vision of a concrete future scenario and building a story. Because of its prompt structure similarity, the first tool that has been analyzed was "The Thing of the Future" by Situation Lab (whose structure is very similar to the IDEO Method Cards), followed by the "Alternative futures" designed by Tangity which provides an interesting process of storytelling. Among the other toolkits analyzed, the essentiality in framing a topic in "The vision of the future" by Nordkapp inspired me in the way it was built and led me in selecting this tool too. These tools helped me in defining these variables: The message from the future, the object of the future, the object, the behavior, time, places and space, the topic and the cause, the rules in the system, the Arcs, the mood, and the terrain.(fig.13)

It had been very interesting while observing them to notice how there were some connections with the Midjourney prompt key structure. Especially in the storytelling structure of the Alternative Futures, there was a visible overlap with the topics that the AI system requires to express to build a well-written prompt.

<fig.13
The envisioning
variables
considered at the
beginning of the
process.
Labels are present
in the selected
ones only.

This insight led me to demonstrate how prompt
writing itself can be useful for scenario building.
Despite everything, it was proper to make sense of
the variables by building a structure with meaning
to maintain their significance. While some variables
have been clustered in macro-categories, others have
been merged in the Midjourney ones because of their
overlapping purpose.

The design process was now verging towards the construction of a game dynamic.

I wanted thus to understand accurately what was
the purpose of combining these variables in a certain
order, by defining an input and an output. Since a
meaningful scenario vision always starts from a clear
scenario definition and statement, I have decided that
the input of the tool should have been a framing of the
scenario and, as an output, a sort of Cover Story made
of a written narration around the generated images to
support the communication through storytelling. By
adding in between some moments of individual idea
generation and some collective ones I ended up with a
general game structure (that have been implemented

later in the design process) composed of 5 steps:

>1 Terraforming: common ground is prepared to start from the collective research.
>2 Prompting: each participant is called to write their idea as a prompt.
>3 Generation: all the prompts are translated into images
>4 Arena: all the ideas are shared and discussed
>5 Story: a shared story is written, starting from the discussion insights, supported by some images generated.

Yet the structure was pretty simple, but the possible dynamics behind the game were many. I have thus started from the one that I thought to be working the most. Then, guided by some tests, I tried to implement the most suitable solutions to adjust the process, until I have defined a final product.

>fig.14
The categories
containing the
Midjourney and
envisioning
variables and the
first game dynamic

Prototyping sessions

Throughout the design process, the game format underwent testing specifically on three major occasions (and different situations) to fully comprehend its potential and to identify areas of improvement. The workflow has been evolving mostly in the dynamics, by integrating the feedback collected during qualitative interviews with the participants held after the testing sessions.Alongside this workshop testing, it has been demonstrated to be essential also following the evolution of the AI diffusion models and the hypothetical direction that governments and companies are taking. The Oracolo prototypes evolved from Midjourney version 3 to version 5, therefore ...

... the level of complexity embedded in the result of the sessions was higher , considering that the outputs of the workshops could have been influenced both by the dynamics of the game and the evolution of the machine.

This process has thus been supported also by feedback from other users and members of the Midjourney community and the news around the topic that helped me in understanding the potential of the tool over time.

Hence, the challenge and purpose of Oracolo have been identifying a form that could somehow stand obsolescence, ...

... to give value to the project in a broad time horizon and to bring the efficiency of the tool according to the user tests.

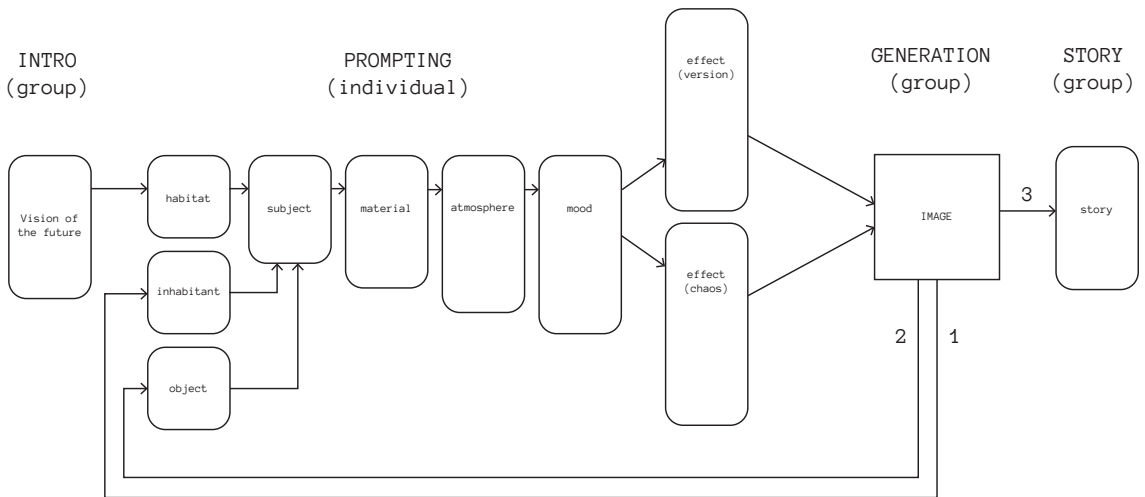## 3.2.a First prototype test: Small international group experience

The dynamics
Among the different concepts of workflows, there was...

... a cyclic narrative loop that became the first version of the tool.

The idea was that the process should have started from a common agreement on the scenario features and, from that each member should have built a personal image around how their imagination would picture that scenario. As an arbitrary choice, I have decided to keep "The Vision of the Future" as a starting point of the process, because of its synthetic and clear structure. This has been implemented with some other variables (such as the Arcs, by Jim Dator's four generic futures) that have been removed later. The same happened to another layer of complexity present in this version, the loop structure, which was ideated to build layer by layer a complete picture and so, a complete narration in just one picture. For instance, the participant was asked to question how he/she would have been representing the habitat in one picture and, from the generated picture, what inhabitants would have lived in that scenario. The second picture was generated over the first one and should have been furthermore integrated with an object that could be used by the inhabitants in that habitat.

Once each person completed a picture and idea of a scenario, by sharing them the group should have been inspired in writing a common story.

INTRO
(group)

PROMPTING
(individual)

effect
(version)

GENERATION
(group)

STORY
(group)

Vision of
the future

habitat

subject

material

atmosphere

mood

effect
(chaos)

IMAGE

story

^fig.15
The first prototype
testing flow

The test
The first test was conducted in a small international group of 4 designers. It is important to consider that this testing has been done mainly to understand the steps of the process and that the result was used exclusively for the Oracolo testing session. The research was thus given, and the Discord server was already created before the session. The participants carefully followed the narration and generated images just in one computer, using the Midjourney V3 version. The results were pretty interesting: the general structure of the 5 steps was working, but the session was limitless and it took too much time to generate all the images. Moreover, the prompt overwriting on the image (e.g. inserting the inhabitant after the generation of the habitat picture) was not working for Midjourney V3, besides the fact that it required a lot of time.

For instance, when it has been required to represent a sand city with skyscrapers, a robot was added in the middle of the picture ...

^fig.16
A city in a desert, cultivated fields
inside skyscrapers with scarn look,
concrete, dust, 3d, cold colors,
noisy, landsacpe picture, high
resolution, dark, light comes form the
buildings, loneliness, --chaos 90;
Romanazzi E, January 2023.

^fig.17
A city in a desert, cultivated fields
inside skyscrapers with scarn look,
concrete, dust, 3d, cold colors,
noisy, city picture, high resolution,
dark, light comes form the buildings,
loneliness;
Romanazzi E., January 2023.

... and, when asked to add the object instead, the inhabitant was not appearing anymore.(fig.16-17) Nevertheless, this insight helped me in understanding the need of fixing the prompt before discussing the content of the picture, since the first approach with AI is not always working accurately.

Talking about the further steps of the tool, the discussion was very insightful. Each participant had generated a different image of the same scenario from different points of view. The topic was "The future of automated agriculture in cities characterized by climate change" – some of the participants represented the industrial and productive aspect of it, some others the architectural shape of a future city, and others the landscape had changed because of the climate.

The freedom given to the generation led to a
meaningful conversation but the length of the tool
didn't allow it to go deeper in the story because the
timing was very tight. The result was, however, pretty
cohesive and interesting.

3.2.b Second prototype test: international and multidisciplinary groups

The dynamics
The original card deck has shown how the dynamic of
the process was generally working but needed some
refinement in the first steps. The second version of the

tool was thus removing the cyclic image generation process, integrating a more specific card to frame the general scenario vision, and adding a playful element after the first round of generation to stimulate discussion and support a regeneration phase. The participants were therefore involved in the choice between three placeholders: adjust, mix, and trade, and so they had the opportunity, once the image had been generated, to mix with the other people's visions, adjust their prompt or trade it with other players. Moreover, I have opened the possibility for each participant to generate their image in the same Discord server, to smooth the process and make it more agile.
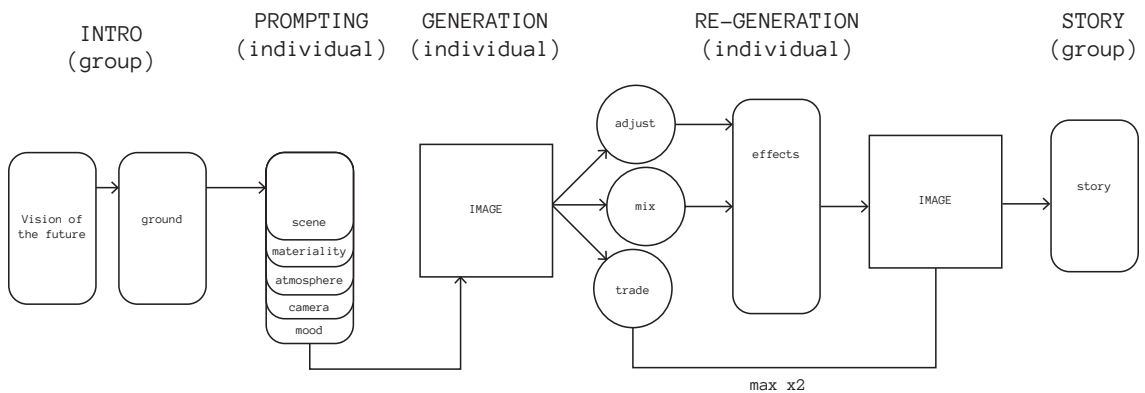
^fig.19
The second
prototype testing
flow

The test
The second version has been tested by 2 multidisciplinary and international teams of 4 and 5 people each which worked separately with the same approach. The tool this time was fully integrated into a real future thinking process since it has been tested during the 10-day-long workshop at Politecnico di

Milano, part of a series of Digital Maturity Learning Labs of the DC4DM project funded by the ERASUMS+ program. Because of this, the research this time was pretty consistent and personal. The groups were also in extreme need to find a common idea, especially because the test had been conducted at the end of the workshop, where the stress was higher since the deadline for the presentation was getting closer. Nevertheless, there have been very interesting insights, both from the test results and from the qualitative interviews I conducted after the test.

> The most interesting feedback of the second prototyping session was that even if it took place – as scheduled – before the scenario matrix presentation, it has been integrated spontaneously also later in the process, once the dynamics of the scenario werewell defined.

The purpose in that case was the need to visualize a narration and to build storytelling.
The comparison between the first test and the second application was also pretty impressive. When at the first try the scenario matrix was clear but general, and the pictures resulted to be very generic rather than personal visions. On the second try instead, the pictures werevery interesting. They have been generated both with Midjourney and DALL-E (because of some technical problems) but even though the images have been generated in two different engines they were all very accurate and cohesive in the story. For instance, to represent an individualistic future where food is regulated by the government and people have hyperpersonalized diets based on super food, the first try was maily the representation of people in the streets or at home taking super food, such as
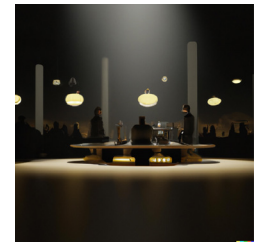
^fig.20
Rough scenario: An
asian woman on the
street taking some
supplements.
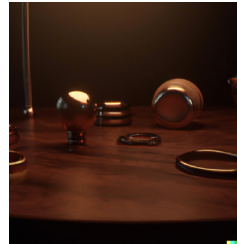
^fig.21
Clear scenario:
The future
restaurant, the
experiential
super food
tasting through
accessories for
its integration
into the diet.

stock pictures. At the second one, there have been
representations of the experience at the restaurant,
where people thanks to special accessories could taste
new super food and update their diet.
The images were really coherent in the narration and
by discussing them it has been possible to create a
strong future scenario.

By learning how to communicate with the AI more
effectively and by having a clearer idea in mind, the
results became very intriguing. I have understood
that the tool should have been inserted further in the
process when the dynamics of the designed scenario
have already been defined. In the next version, I will
thus insert a card to better summarize the idea of
the scenario to agree upon, rather than defining the
subject to represent.
However, the issues encountered in this testing session
were mostly linked to the management of the session.

‹fig.22
The second
prototype testing
session

Since everyone was allowed to generate their pictures, it has been hard to guide the session through the process.

Moreover, as soon as a participant was generating, the others were influenced and they were modifying their prompt as well, even though they had a maximum of two possibilities of adjusting, mixing, or trading. In the next test, I have thus tried to integrate some of these insights into the design process.

3.2.c Third prototype test:

<u>The dynamics</u>
In the third version of the tool, the changes that have occurred relate more to the topology of the tool.

I wanted to work on accessibility and in particular on designing an open alternative to the purchasable one, by implementing it with a digital and open-access version, such as a Miro board.

Following the results of previous tests and the development of the discipline, I made some changes in the structure of the prompt, placing more value on the aspect of subject description and qualitative rendering of the image. I also wanted to leave the various steps freer -- albeit guided -- so that discussion is encouraged.
The steps of the process were simplified by keeping the introduction with the sole purpose of defining the vision of the future and describing in more detail the dynamics of the chosen scenario. The prompting

phase has been revised with some adjustments (and with the possibility of adjusting the prompt only once), while the discussion phase (which I called the arena) has been graphically represented in the game space, creating dedicated spaces to keep track of the discussion. According to the last feedback, I have decided to test the tool after the scenario definition to generate more valuable results. Digitalizing the whole process was very insightful also during the physical tool design itself since it helped me in clarifying some dynamics. For instance, I realized how easier it was to have a complete view of the process by reporting all the information in a shared space, such as a round table. This awareness later led me to build a final physical version that resumed this feature.
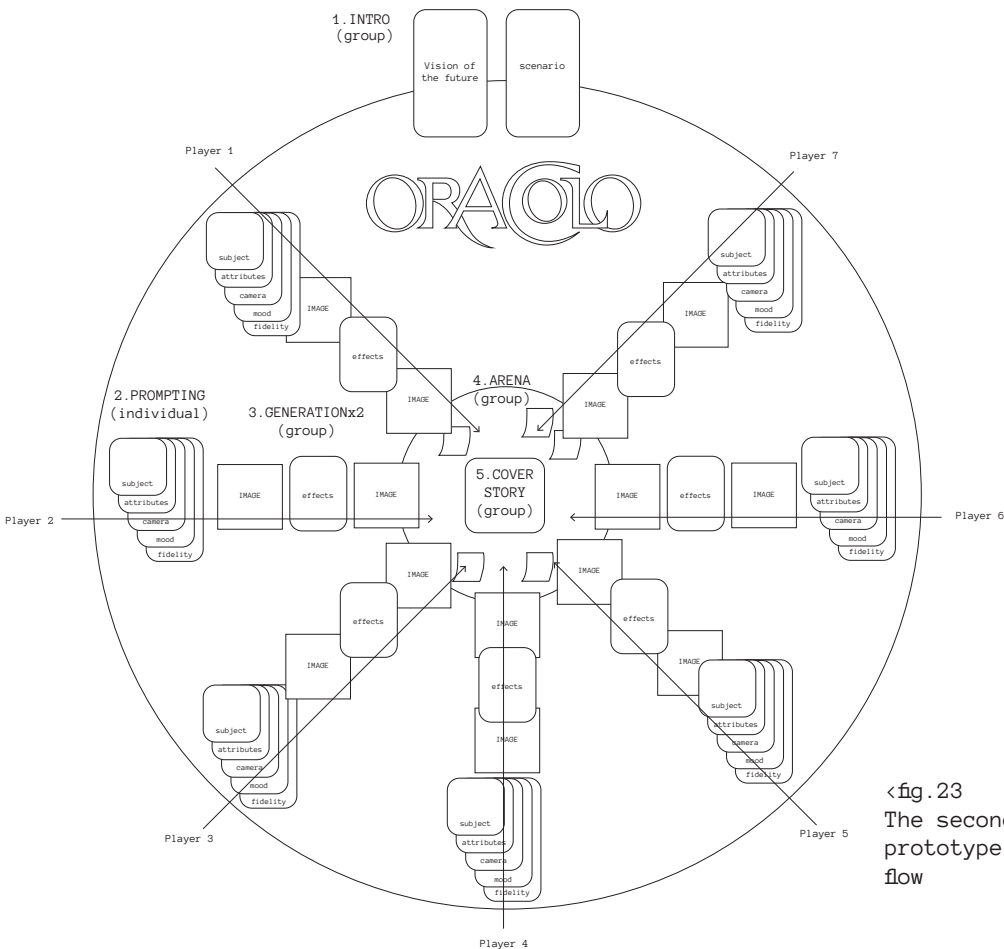
‹fig.23
The second prototype testing flow

The test
Whereas the first and the second prototyping session has been done for small groups, …

… the third one has been done in a class of 50 design master students at Politecnico di Milano during the course "Design Futures". The class was subdivided into groups of 6 to 7 students each and because of the size of the workshop this time I have decided to test the Miro board version.

The presentation pitched in front of the class started the session. Each group had access to the Oracolo Miro board and copied and pasted the board elements (containing all the instructions) into their board. Even though in the second test the creation of a Discord server took around 10 minutes, this time (because of the large size of the groups), the setting took more than expected and most of the groups started the tool by generating the images by using one single computer.

As a confirmation of the second test, the groups that had a clearer idea of the scenario were more able to represent their visions of the future but still were supported in working with their imagination.

Moreover, I noticed how setting the server before the session and generating it in a single computer helped to manage the session better with better results – similar to what happened in the first workshop. I have thus decided to apply these changes to the final tool, both digital and physical by inserting this tool after the scenario building and by managing the session by generating the images just in one device.

Another important insight emerged about the number of participants within each group. This session has shown how the more people in the group, the harder it is to get to a common result and the more time required to generate all the images. Therefore, I have decided that the players should be from 3 to 5 people, preferably 4, and, for instance, that the Toolkit box should contain material for 5 participants.

Nevertheless, the Miro version is essential in supporting big workshops and this testing had positive results in that aspect.

‹fig.24
The third prototype
testing session

>fig.25
Group 6:
representations of
the same scenario
before the arena
step.

What was also showing some doubts in this session was the difficulty in understanding the language of the machine during the image generation: the participants at first were writing their visions as complex sentences rather than lists of variables. By interviewing the I also understood how this issue was mainly due to misunderstandings on how to prompt.
I thus have tried to evolve the design according to this feedback, even though these issues have been demonstrated to be specifically linked to the 4th version of Midjourney. What was also needed was a more detailed explanation and guide through the steps.

For this reason, inspired by the role-playing game structure, I decided in the final version to introduce a level of storytelling along the process.

This key solution helped me also in solving another issue mentioned before – the session and time management.

3.2.d The control of the game: the Oracle and the Sibyl

When talking about role-playing games, we are generally talking about games that involve full immersion in the gaming session. The narration is the core of the game in order to make it work and there is usually a narrator, or master, that helps all the participants in following the story.

> I found that the level of complexity in this envisioning tool was enough to call for a narrator role, that could have both explained the difficult passages and managed the images generation session.

The idea came by thinking about the mystical idea of the AI as an enabler to see the future, a sort of oracle that could be awakened in times of need to visualize what people cannot see. And this "invisible" was, for me, the ideas that we as humans struggle to represent, such as our imagination about scenarios yet to come. This envisioning tool took the name of "Oracolo", the Italian translation of oracle. The oracle idea has origins in Ancient Greek culture and refers to the entity able to predict the future, as well as the site where these prophetic predictions happen. These prophetic predictions and responses were practiced by Sibyls, prophetesses (and oracles) inspired by God. Their feedback was often ambivalent and vague and anyone who relied on them often interpreted their prophecies. I thought then that the narrator could interpret a Sibyl, who in this case gives feedback

on people's will, inspired by AI. Each person is then called to interpret and give meaning to their personal vision, by explaining it to the other players in order to find a common story. This narrative helped me to give meaning in assigning the control of the image generation just to one person and to make all the participants follow, passage by passage, the instructions of a given handbook.

3.2.e The design evolution

During the tests, the design has evolved to support the communication between humans and machines keeping in the count, of course, of the user experience.

The first versions of the design were some disposable cards, on which were printed all the information on what to write by interrogating the participants about the variables.

In each, the card was furthermore explained the correct way to communicate with the AI, for instance, by listing all the elements with words followed by commas - this language was also induced by the graphic design of the cards, with blank spaces and commas. However, this has demonstrated to not be clear enough for all the participants and the disposable aspect of the cards was not enabling the tool to last long.(fig.26) I have thus decided to create a variation of the shape of the cards, by designing some rigid cardboard cards with special windows in which the participant was supposed to fill each space with the required information by applying a Post-it on the back of the card. The user was thus guided in building the prompt by the shape of the card. Even though this design was quite functional for the V4 Midjourney version, it was converging towards a direction that could have been obsolete with the evolution of the
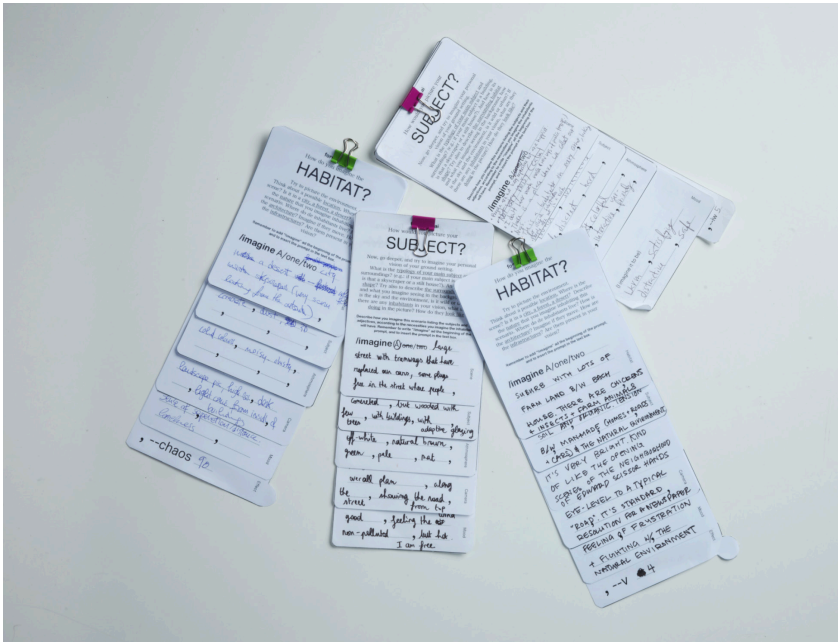
‹fig.26
The first two
disposable versions

software.
This design didn't manage to have a test since the
evolution of the software arrived before. The V5
version showed that the direction of the diffusion
models is towards a more human-like communication.
As reported in a Medium article the way to
communicate with the V5 machine is to use "natural
language" instead of lists.[11]

[11](DelSignore, 2023)

Moreover, since during the third product testing there
have been some issues due to an excess in narrative
while prompting the machine, I wanted to verify how
a prompt written by a student - that was not working
accurately with the V4 version - was actually well built
for the V5 version. The result was spectacular.
The operation was done from the following prompt:

*"I see an abandoned farmhouse, all around are huge
white futuristic machines tilling the fields. The sky is*

[11] DelSignore P., (2023) "Midjourney V5 introduces a NEW approach to wri-
ting prompts, Medium. Available at: https://medium.com/generative-ai/midjour-
ney-v5-introduces-a-new-approach-to-writing-prompts-a74a372faabe) (Accessed:
April 7, 2023).

gray and cold, the landscape is degraded but clean the cottage is made of stone, the machines are made of smooth white plastic, the fields are yellow and rough. The focal is 50, the cottage is in the foreground while in the background are the fields and cars creating smoke and driving in a straight line and cultivating the fields. The weather is grim, a grayish photographic filter is applied to the photo, there are crows flying around. The quality is grainy, the photo is a little low quality blurry, but you can feel the materiality of the cottage in the foreground"

In the first image we can see how this kind of prompt led to an unpolished and accurate representation (fig.27) when generated with V4. In the second instead, it is striking how effectively the machine - Midjourney V5 - competely centered the prompt (fig.28).

By demonstrating this, I had the certainty that the direction undertaken with the design was the correct one.

To bear obsolescence the design should have been based on the way we structure the thought to imagine a picture, rather than focusing on the language of the Midjourney bot.

The final design of the prompting phase has thus kept the cards structure but freed the part that was designated for writing by leaving a free space to write. A large window overcomes the subdivision between the variables and the Post-it application on the back of the card encourages the reuse. The window allows the user to be free in writing, still, getting inspired by the machine variables written above. These variables, even if the diffusion models will evolve, will still be essential in building a cohesive and meaningful scenario vision, avoiding obsolescence.
This deck of cards because of the fast evolution of the software is meant to evolve too and I have supposed that this tool will be implemented with a new handbook and some external effects cards in the future.

‹fig.29
Oracolo study
models evolution

Oracolo: a more-than-human envisioning tool

PRODUCT

The product

4.1.a Oracolo: a more-than-human envisioning tool.

Oracolo is a future thinking design tool, designed to support groups in envisioning sessions. It enables all the participants to communicate their ideas of a collective scenario thanks to AI-generated images and, through an image-supported conversation, to write an agreed story of the future.

›fig.30
Oracolo box set

This tool fits in the futures thinking design practice to include the personal scenario visioning with the group scenario building and its storytelling, in particular, when a rough scenario has already been designed, but it is necessary to build storytelling. The purpose is to solve the lack of cohesion between the participants' ideas of the future and the need for moderated participation in its envisioning before finalizing the idea. It is thus mainly thought for multidisciplinary and international foresight workshops, but also for groups struggling to find cohesion in ideas.

4.1.b The versions

> To make the tool accessible, it has been designed in two compatible versions: a deck of cards and an open-access Miro board.

The dynamics of the process and structure are very similar, and both include the use of a personal device to generate images with AI. Despite this, they have been designed to not exclude the other. The purchasable deck indeed guarantees a better experience because of the interaction with the dynamics of the game and the physical product, whereas the Miro one could ease the sharing of AI-generated images, and support remote workshops, which is an essential asset.
Physical experience is widely required in consultancies, companies and institutions to get a more engaging experience and for workshops themselves to perform well – however, the exclusion of the digital version would have made the process less participatory and widespread, especially considering the tendency of hybrid work.
Moreover, this flexibility has shown to be very efficient

also under the group size flexibility factor. As tested in the prototyping sessions done during the design process, it is extremely compatible and manageable to organize both small groups (four to five people) and large-size (fifty people) workshops and even quality results are quite similar. This aspect broadens the product accessibility spectrum even further, in support of spreading the design futures method literacy.

Physical version: The game box

4.2.a The Oracolo board game box

The physical game version is inspired by board games, and is purchasable in a box containing all the elements for the envisioning process. In detail, it hosts:

> 2 Terraforming cards
>   (1x Vision of the Future, 1x Scenario)
> 20 Prompting cards
>   (5x Subject, 5x Camera, 5x Atmosphere, 5x Fidelity)
> 20 Effect cards
>   (5x Weight, 5x Blend, 5x Chaos, 5x Seed)
> 8 Placeholders
>   (4x object, 4x habitat)
> 1 Story card
> 5 Post-it notes blocks
> 15 buttons
> 1 handbook

>The box

The box is an A4 box, covered by a print with all the info of the game on both sides. While opening it, it is possible to have an overview of the various elements composing the game. The packaging interior indeed has been designed to host different-sized cards which have been arranged on multiple levels of laser-cutted 0,5 mm sandwich material, according to the depth of the components hosted.(fig.31)

<fig.31
The box

>The cards, the post-its and the buttons

Oracolo is structured by steps, guided by cards of 4 different types and formats. These cards have been designed according to a modular scheme (that is incremental in the "Imagining" phase, to allude to the depth of reasoning in the construction of the prompt).

To maintain the quality of the product – and therefore of the experience — over time, they are thought to be manufactured in 0,8 mm cardboard, which is printed on both sides and die-cut. Nevertheless, the key to the durability of the game is the shape of the cards themselves, which is characterized by a window in the middle of the card.

This window allows you to see through it, and for instance, to have the possibility to write infinite prompts by placing a new Post-it on the back of it. As you can see in fig.32 on the back of the card there are some marks signing the correct position of the Post-it and guiding the user in its application. Another peculiar detail is the buttonholes on top of the ideation cards. These incremental cards at a

>fig.32
The cards and
the Post—its
application

certain point of the process need to be placed one on the other and joined together. Therefore the box also includes pairs of "buttons" – which are verily M5 Chicago screws with a matte black finish – supposed

to be inserted at the corners of the cards as a joint. Moreover, the 45° cut allows the cards to not fall, and ease the positioning of the joint.(fig.33)

<fig.33
The buttons
application

>The Oracolo handbook

The Sibyl will have in the Oracolo session the narration role. It will be interpreted by a participant, who will be the only one in charge to generate images and to guide the whole session both by following the narration of the handbook and by keeping the timer. The handbook contains all the information needed to manage the session, from the narrated parts to the practical actions that the Sibyl will have to follow to generate images and share them. The first part is an introduction to the game and the game setting, while the second part follows a narration: there are two types of font, one dedicated to the Sibyl's duties and one for the general indications to be followed by all the participants.

It is important to note that, since the handbook is thought to explain all the passages in image generation, it may become obsolete over time – in contrast to the tool itself. This handbook is thus dated and thought to be integrated with the new versions by the software updates. (fig.34)


>fig.34
The Oracolo
handbook

>Process dynamics

This process of narration could be seen as a way to better structure the moderation of image production and the image conversation. The role of the Sibyl is therefore essential also in managing the group discussions and even more in the time and group management. The Sibyl will thus set a timer during the session, according to the timing suggested in the handbook.
The Oracolo session lasts approximately 120min, including the reading of the manual and all the activities of conception and generation, which are

divided into six steps.
The first one is called "Terraforming" and is the phase
in which common ground is prepared. From the
previous research, all the most important visions are
framed in order to build coherent scenario visions. It
will be followed by the "Imagining", in which each
person will picture their scenario imagination into a
prompt. Subsequently, thanks to the hand of the Sibyl,
the AI will generate images of the visions in the phase
of "Visioning". Since the image generation stimulates
the willingness to adjust it, it is accompanied by a
"Re-visioning" step where each of the participants will
have the opportunity to fix its prompt. Once all images
have been generated the "Arena" step takes place. A
common vision is discussed through images which are
interpreted and explained to the group. The result of
the process culminates in the "Story" step, where from
all the visions and from the key points discussed in the
arena a story is written.
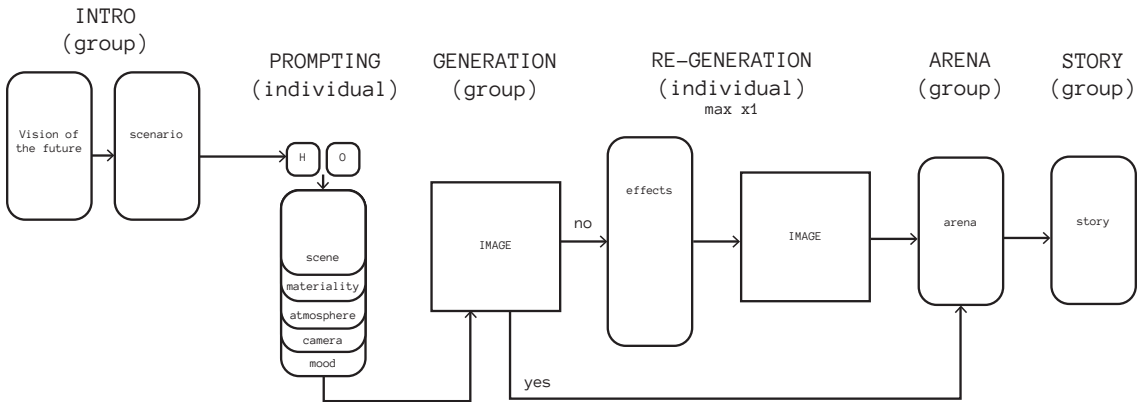
^fig.35
Oracolo Dynamics

4.2.b Setting the game

All the process its timing and the outputs are guaranteed on the condition that the session setting takes place one day in advance.

This is eventually done to ensure that all the participants have access to the Discord server, which is essential both for the success of the tool and the quality of the outputs. It is thus strongly suggested before the session to proceed with setting the Discord Server with the Midjourney bot. The setting requires 4 steps, explained here below.
The second part of the setting concerns the identification of a Sibyl, and the preparation of the material such as the buttons, the cards, the post-its, and as many pens as the participants, which are not included in the game box. It is moreover suggested to check if the disposable material (such as the Post-its) is still available in the box before starting.

>1.Download Discord

To have access to Discord, browse www.discord.com and follow the passages on the website to log in. There is also the Discord App that you can download on your device if preferred. Since each participant should have access to the Discord server, each of them should create an account.

>2.Create a personal server

Discord is an app structured as a platform made of channels, which are called servers. To work in a shared space with the team, it is necessary that a person in the group creates a personal server and

shares it with the other participants. To create a personal server, click the + on the left bar to create a new server. Select "create my own", and "for me and my friends" and name your server. It will create a server that you can find on the left bar. By clicking on it you can create channels to organize the information but also share the server with other people. Let the other participants join your server by sharing the link.

>3.Join Midjourney

At this point, it is required to access the Midjourney general server before getting started. This is possible by searching among the servers available in Discord or by browsing www.midjourney.com and joining Discord from the official website. By joining Midjourney, you'll be part of a community with whom you can share your results or get inspired by their prompts.

>4.Invite the Midjourney bot to join your server

As a further step, it is required to invite the Midjourney bot to join your server. Go to the Midjourney general server and choose a channel on the left (es: #getting started). It doesn't matter which one, but this action is necessary to see the list of the participants in the channel. At this point, you might see the list of participants in the Discord chat on the right side of the interface. If it is not shown, on the top right you might click the icon with a shape of a person: by clicking on it, this will show (or hide) the member list on the right. The Midjourney bot will be present as one of the members of the chat, click on it, and click the button "Add to server". It will be required to select the server to which you want the bot to be imported. Select your team server, and authorize the bot to join it. Everything is set, but notice that before starting each member of the group should accept the ToS to interact with the AI.

4.2.c The process dynamics

>First step: Terraforming

Oracolo is designed to fit in a futures thinking design process as a more-than-human envisioning process. Hence, in the first part of the process, there are two introductive cards to be completed in order to prepare the ground. These are recalling the research previously done collectively and are used to better frame the requirements for a personal vision of the future. The first card is called "The Vision of The Future" and it is a step that takes inspiration from one of the most common future thinking design frameworks, designed by Nordkapp. This step is essentially the first framing of the direction taken to generate the scenario.

>fig.36
Terraforming cards

The second card is the "<u>Scenario</u>", a framing for the chosen scenario within the vision. This card is composed of two windows to be filled in, one for the title of the scenario and one for a small description that all the participants agree upon and have to keep in mind before starting prompting. To enable and support the game dynamics, these two cards are positioned in the middle of the table.

>The second step: Imagining

The second step is dedicated to personal ideation and vision prompting. As shown in the design process, it has been designed by collecting different text-to-image prompting variables and clustering them into wider categories that have been translated into cards.There is always a tendency in representing habitats because of the versatile structure of the prompt, so, before starting the proper imagining session, ...

... the Sibyl will thus give each participant the possibility to choose between the representation of an object or a habitat, where at least one person in the session should represent an object. (fig.37)

The participant receives a placeholder that will keep close to the cards, to keep that detail in mind. This choice is strategic in the perspective to obtain a meaningful output at the end of the whole process. Here below are listed the different cards that represent the different categories explained more in detail and followed by the explanation in the narrative passage read by the Sibyl during the session.

(scenario description)

>fig.37
H,O placeholders

>Subject card

The subject card is the most influential card among
the four. It is essentially the main framing of the
subjects of the images, including details, attributes,
actions, and location. (fig.38) The space given in the
card is more compared to the others to give the user
more freedom in writing the core of the prompt. To
complete this card the participant will have 3 minutes.
Sibyl will introduce the card by reading this passage:

*Dive into your scenario and look around. Imagine being
in it and thinking about what you see, how it looks, and
what is happening around you. Now, choose a spot, and
imagine taking a picture of what you see, it could be an
object or a habitat according to what you have chosen
before. What do you capture? What is/are the main
subject/s of your picture? Try to write down the general
elements that could represent it and their characteristics
in a sentence. Describe also what you see around, the
setting in which you imagine this subject being pictured.
Try to answer these questions: What is the main subject?
What does it look like? Where is it located and how is
the background? To complete this card you'll have 3
mins. Take your time to think: you'll have time to fix it
later in the process.*

‹fig.38
Subject card

>Camera card

"Camera" is the given name for the second category
and contains all the characteristics and settings for
the image.(fig39) The user is called to specify all the
details of the composition, from the kind of shot to
the position of the camera to help the machine in
understanding the picture that the participant has
in mind. If a person has some knowledge could also
add some specific camera settings details, but is not
required. The Sibyl will introduce the card by reading
this passage:

*Let's think a bit more about what kind of picture you
are taking. In terms of the kind of shot, is your picture
a portrait or maybe a landscape, or is it a close-up? Is*

there any picture effect, like, for example, is it a picture in motion? Also, imagine where you would position the camera. Is it a satellite, an overhead view, or a sea-level picture? And is it taken with specific camera settings or a specific camera lens? In case, be very specific.
Write down your information, you'll have 3 minutes from now.

>Atmosphere card

The third card is the Atmosphere card.(fig40) This term refers to a broad category of elements that compose the feeling that one can have while moving in the imagined scenario. It can be split under the variables of mood, typology of light, and color palette. It is useful to let the player be truly immersed in the vision

>fig.39
Camera card

and, by doing so, to allow also the other players to be better immersed in how his/her future might feel. The Sibyl will introduce the card by reading this passage:

Walk around the scene, it doesn't matter where, but look around and think about how you feel. How is the atmosphere? Think also about the light over the scene. Is it bright or dark? Is there a spotlight or a soft and diffuse light? What time of the day is it? Is it maybe sunset or sunrise, or simply a cloudy day? Now, think also about how this atmosphere makes you feel. What is your mood and how is the vibe? Write down also if there are any specific emotions that you feel. Finally, reason around the color palette, color filters, and specific chromatic choices that make you feel in a specific way. Write them down. You have 3 minutes from now.

‹fig.40
Atmosphere card

>Fidelity card

As a last step in the imagining process, the participants go through the definition of the "fidelity" characteristics, which refer to the quality expected from the picture. It is required to think about the level of detail that could, for instance, help in showing the complexity of the scenario, the resolution, and the typology of output (e.g. a picture or a render).The Sibyl will introduce the card by reading this passage:

The last step regards the fidelity of your picture. What is the quality of the picture you expect? Is it high quality or low resolution, 4K, or 8k? Is it photorealistic, cinematic, or is it a render? If you want a picture-like image it is necessary to explicit it. Think also about the detail level. Does it have an intricate, high level of detail or is

>fig.41
Fidelity card

*it an analog picture, noisy and blurry? You have now 3
minutes to write it down.*

At the end of the process, each participant is required
to put each card on top of the other by following the
incremental shape. This deck of cards is pinned thanks
to the two buttons delivered by the Sibyl and a solid
prompt is ready to be delivered.

<fig.42
The full prompt

>The third step: Visioning and Re-visioning

As a third step in the process, from all the gathered prompts the Sibyl will insert all the information into the Discord server by following the passages written in the handbook. The visioning phase is however a hybrid between the generation of images itself and its refinement since the process of image generation is quite holistic.

When a participant is ready, the prompt is delivered to the Sibyl who will interact with the bot and create the image and, by the time this operation ends, the other participants are allowed to finish their prompts if the time in the imagining session was not enough.

The Sibyl will then ask the participant if he/she is satisfied with the output, if the answer is yes, she will proceed with the upscaling of the selected image. Instead, if the answer is no, the prompt is handed back to the participant who will have the option of applying or not applying for an effect card or fixing the prompt mistakes. The image will be regenerated and the player will choose one image among the 4 to be upscaled as a final one.

There is often quite an interest in the players to regenerate images, which is due to the surprise that the output arises. This inspired me in designing a specific phase in which the players involved are allowed to redesign and adjust what they have thought initially. However, this reaction could bring the focus of the group on the wrong path if not regulated – as happened in the tests done along the design process.

Here comes the decision of allowing the regeneration only once, guided by the narration of the Sibyl and the use of the effect cards.

The effects cards in the final version are chaos, seed, weight, and blend, which have been selected among other Midjourney parameters for their usefulness.

<fig.42
The effect cards

>Seed
The seed card allows you to generate a picture with the same engine as another picture. By recalling the seed of one picture (which is a specific value), you can generate very similar ending pictures to the image generated before. This is useful when the idea is to create coordinated pictures, such as for storytelling purposes.

>Weight
This card will give different weights to the elements in the prompt. If the desire is a subject to being more present, it is possible to weigh it more. Alternatively,

to reduce an element, it is possible to decrease its presence.

>Blend
The blend card will allow you to mix two or more different upscaled images blending them into one single image. It can be useful when two participants want to see what is the sum of their two visions, for example.

>Chaos
With the Chaos card, the AI will have more agency over the prompt and will abstract the images, creating less photorealistic and more crazy ones.

The step ends when all the cards have been upscaled, and the Sibyl is called to download all the pictures and send them to the group server by writing *"The oracle has visioned:"*.In this way, all the users can see the pictures by accessing the group server as a summary and it is possible to easily compare them.

>fig.43
The Sybil generates
the images for the
whole group

>The fourth step: Arena

Since this tool has been designed to support the envisioning conversations, the arena step has been designed to enable each person to find space for expressing their opinion about the future.

The results are thus discussed and compared, the differences are noticed and in turn, everybody can tell their interpretation of the scenario by describing their picture.

Every participant takes notes and intervenes in the discussion to build a future vision that everybody agrees upon. The dime dedicated to this step is 15 minutes.

>The fifth step: Story

The Oracolo session ends with a story - the participants from all the information gathered during the aligning session are now called to create a story that includes all the visions.(fig.44) Since there will be both habitats and objects, a dynamic story could be created, by mixing and matching the different ideas. The output of the tool is therefore a written story that can be visualized by AI-generated images from the imagining session or, if there is still time, by images generated collectively after the Arena step.

Thus, with the creation of a story and the support of images, we can picture a complete future scenario and communicate it as a Cover Story.

>fig.44
The Story Card

## 4.2.d The digital version: Miro

The digital version of the tool traces the game
dynamics of the physical game and is built on an
open-access Miro board available at this link

> https://miro.com/welcomeonboard/THhXRnExUH1tTWpXa—
2tyN1BlSDAyalRiT2JiVEV0Yl14OENibm53b1ZTUHNaakQ5SExWbFlWb—
DVQY3ZQNllSQ3wzNDU4NzY0NTE2ODg0MTQ4ODQ1fDI=?share_link_
id=788931576117

Moreover, it has also been thought to be shared in the
"Miroverse" page of the Miro website, which includes
all the community templates for proven workflows,
projects and frameworks.
To echo the idea of a round table, it was designed
with a circular shape where all the participants can

take a seat around it. The process starts with the Terraforming stage, which remains high above the round table throughout the process in order to keep in mind the general framing which should be done collectively. Each participant is then invited to stand on one of the stations in the outermost ring of the table, where the green station is the main one and is intended to be the Sibyl seat. From there, following the directions given at each station, the players converge to the center of the "table" to collectively
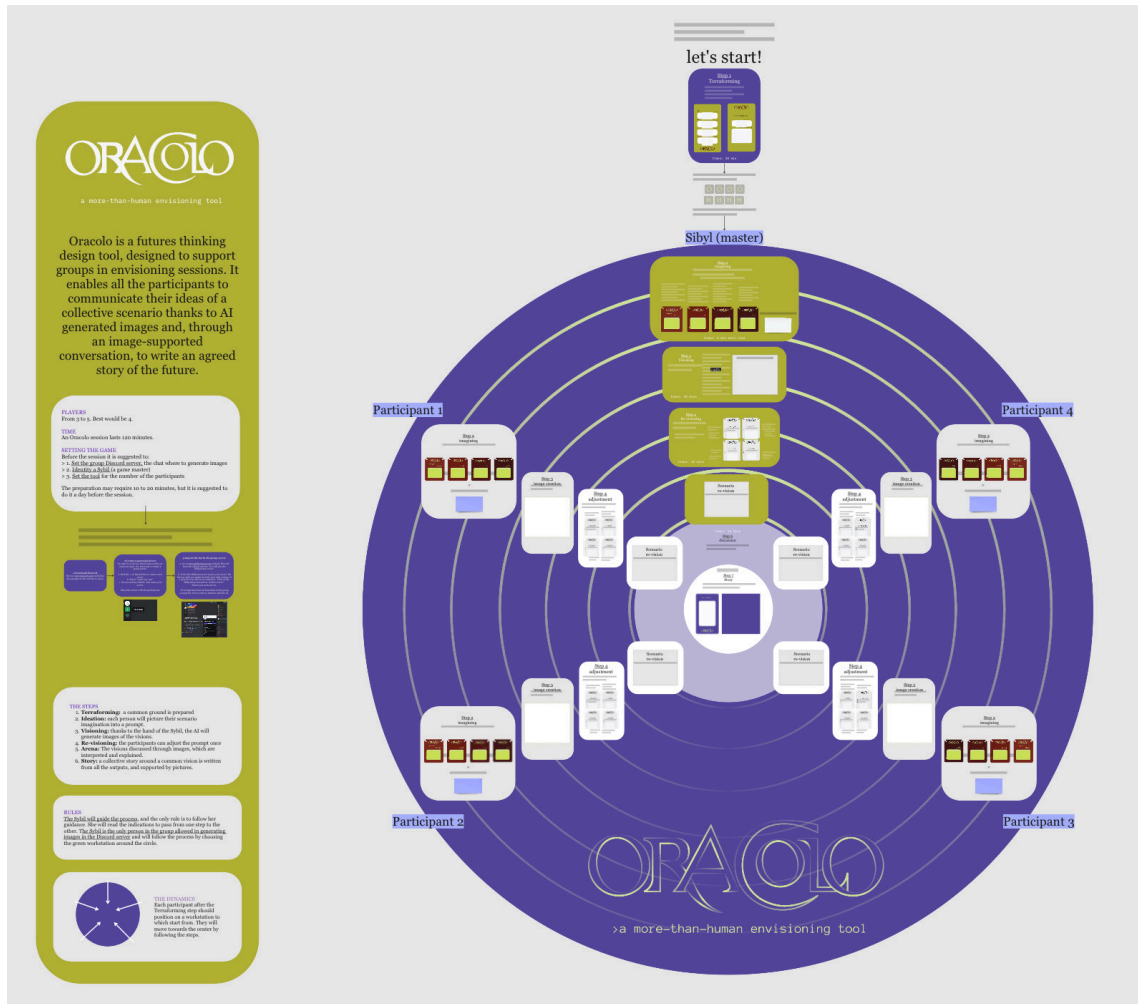
^fig.45
The Miro Board

participate in the "Arena" step and the creation of a Cover Story.

What differentiates this version with the physical one is the possibility to integrate some functions and steps directly in one space. Talking for example about the image generation, it will be possible to observe the images generated directly in the tool, where to support the image-sharing they will be uploaded in specific frames along the process.

Another difference is how the Sibyl interacts with the participants. Since the Miro experience is quite different to the physical one, the Sibyl will guide the process without reading a handbook, but the instructions which are integrated directly into the tool. The same happens with the Oracolo introductive instructions (such as the number of participants or

the game settings) that are illustrated directly on the left side of the board. During the process the Sybil will guide the group by following the green steps and reading all the explanations clearly. The proper technical instructions and the group explanation steps are characterized with two different fonts, to support the ease in reading and understanding what should be read and what should be done.

For instance, at the bottom of every step frame there are the time instructions for each step - this information that is targeting the Sibyl is indicated with a mono font, likely all the other technical instructions for the session management. The Sybil is therefore called in setting the timer with the time suggested by the instruction, after reading all the step explanations. Time management is another interesting feature in the digital version: the Miro Premium version integrates the timer function directly in the tool. This simplifies overall the session for the Sibyl - which should set it for the whole group - and for all the players, who can be aware of the timing throughout the process.
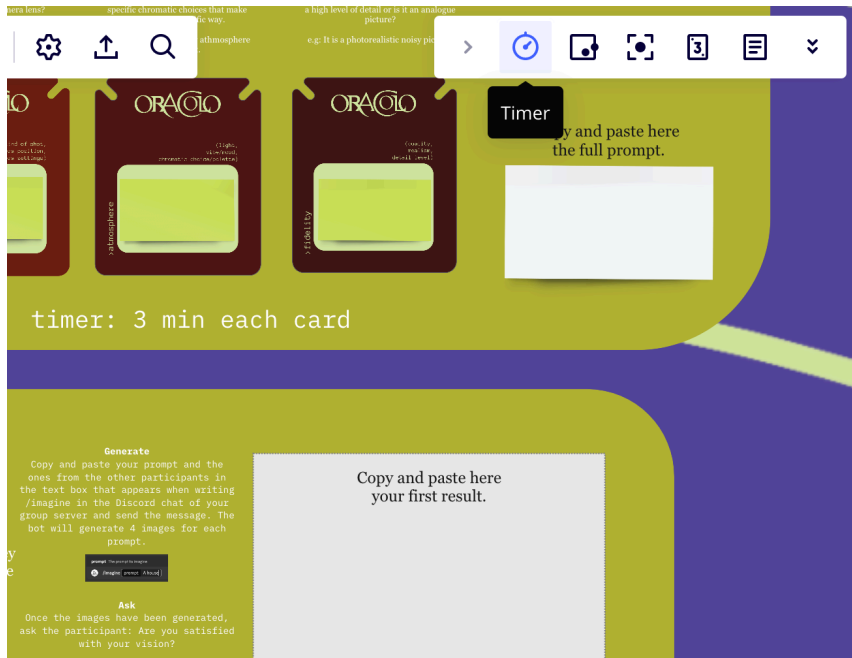
<fig.47
The timer function
in the Miro board

AI as a new frontier of co-designing

Conclusions

Sustainable development in the 21st century must include a more-than-human interaction, and designing Oracolo was a way to let designers stay along with the complexity given by these systems. This envisioning tool indeed encloses the machine structure as a support in creating tangible and valuable visions of the future. By doing this, it also helped in identifying a role for generative AI in the design field, that is no more related to the mere output – such as an image – but is used in creating value and meaning from these outputs by stimulating a foresight conversation. These conversations are essential in the design of futures practice to design a more equal future, as well as it is essential to support the distribution of the practice itself. Thus, Oracolo has been designed as a collaborative tool to build future visions which has both a physical and a digital open-access version. It is structured in a way in which each participant is guided from research to the creation of a cover story that could narrate the future imagined together. Moreover, the use of AI-generated images helps groups of people in aligning their ideas, which find computational support in translating their imagination into reality. This will furthermore help the inclusivity of the futures thinking practice, by enabling each of the participants to have a say in how the future could be. By going through the various objectives identified at the beginning of the thesis, ...

... Oracolo thus fulfills the requirements of an inclusive tool for future thinking literacy, computational support in the early stages of the design process, and support in AI management and understanding to amplify human potential.

Further research might be conducted around these topics and Oracolo is necessarily meant to be a work in progress. Taking into account that it is a technology-based project, it is expected that it may be implemented with software upgrades in the future such as upgrades in the way AI generates and the evolution of generative AI outputs. The evolution of AI should not impact vision building or game dynamics, however, more tests could be conducted on the tool to improve its efficiency, by keeping the purpose to build a more distributed and involved foresight practice and a more ethical and sense-guided AI implementation in design.

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