ALGORITHMIC CREATIVITY: EVOLUTION AND MARKETING PERSPECTIVES

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Abstract: *Even though Artificial Intelligence has been originated as a computer science topic, the concept itself appeared as a vision to build machines that are able to think and act in the same way as humans. That includes the capacity to generate objects that cannot be distinguish from those made by human artists. In time, Artificial Intelligence evolution witnessed successive positive and negative phases. Currently, we notice a new expansion phase, due to increased computing power and availability of large date sets. The current phase has created the premises to build generative tools that may produce impressive creative objects, as discovered by some recent experiment. As technology continues to evolve in a fast pace, it opens promising opportunities for personalization, interactivity, and effectiveness in marketing.*

Keywords: *Generative AI, marketing, technology acceptance*

JEL classification: M31, O33

Introduction

Inspired by the original question that sparked interest in AI, formulated by Alan Turing (1950): "Can machines think?", we will explore a new question that is rapidly becoming a vector for AI evolution these days: "Can machines create?".

The goal of this exploration is to understand practical implications of AI progress in areas where human creativity has been unchallenged until now. People followed a creative process to produce valuable objects for society or firms and thus human talent, practice and qualifications defined very specific jobs, like painters or musicians, in arts, or copywriters and designers, in marketing.

Rise of AI an especially its generative capabilities are already starting to influence contemporary marketing. Even before the appearance of generative capabilities of AI (or "Gen-AI"), scholars anticipated its significant impact in communication and advertising, located at intersection between economic and emotional areas (Koppman, 2014).

A certain area of impact is caused by the algorithmic process to create digital objects that resemble those made by humans, thus forming a new type of creativity: algorithmic creativity. It remains to be decided if this new type of creativity could be considered equivalent to human creativity. Several experiments have been conducted to assess the level of AI creativity perceived by humans. Until recently, the technology has not been able to produce results close enough to human output. However, latest advancements and proliferation of Gen-AI platforms such as Midjourney, Stable Diffusion or DALL-E looks able to reach the point where synthetic objects cannot be distinguish from authentic objects (created by humans). We are probably not yet at the stage where machines could product creative objects entirely autonomous. Their output is based on a prompt formulated by a human and it is often adjusted and refined by the user.

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The topic of algorithmic creativity is considered to be the new frontier in AI research (Oksanen et al., 2023) and the question comprises the creative process itself and the creative outcome. According to original "Turing test", we could assess that a machine possesses artificial intelligence when it cannot be distinguished from a human by a neutral observer (Turing, 1950). However, some researchers consider that this not a test about intelligence, but a test about humanity (Hoffmann, 2020). In this context, the assessment of intelligence should not depend on the process, but on the outcome (Kissinger, Schmidt and Huttenlocher, 2021).

On the other hand, there is a constant search for better tools in marketing to handle the turbulences faced by firms due to growing competition, faster response time, increasing customer expectations and significant productivity pressure as a consequence of digital transformation and technological advancements.

AI evolution

The current period is marked by the universal introduction of artificial intelligence (Iansati and Lakhani, 2020) and concludes a broader stage of transformation, which began in the late '80s with the integration of new digital technologies into the production and communication processes of companies (Castagnoli et al., 2022).

AI has evolved itself as a concept from a technology able to collect, process and act based on data in a way that simulated human intelligence (Canhoto and Clear, 2020) to a technology able to achieve certain objectives in condition of uncertainty (Al Naqvi, 2020).

Evolution of AI has been compared by Bubeck et al. (2023) to four seasons: "AI Spring" in 40s with science-fiction literature, culminating in 50s with Turing question (Turing, 1950) and the start of academic research at Dartmouth (McCarthy, 1955); "AI Summer" in 60s with excitement and first projects, like ELIZA conversational machine; "AI Winter", from lates 60s - a period of decline and loss of interest and financing due to stagnation of AI rules-based approach; "AI Autumn" with a fresh impulse due to change in approach from rules-based to algorithms and machine-learning. During the "four seasons", AI stayed in relative scientific obscurity (Haenlein and Kaplan, 2019), as a sub-field of computer science (Hoffmann, 2022). In time, the first approach (rules-based) lead to development of robotic process automation, while the second approach (algorithms) lead to development of various types of machine-learning (Al Naqvi, 2020).

Nowadays, AI has become a disruptive technology (Petrescu et al., 2022) that provides significant perspectives in marketing (Huang and Rust, 2022). It can enrich communication (Nordin and Ravald, 2023) and improve customer experience (Davenport et al., 2020). Some of researchers expect that Gen-AI will allow firms to react instantly with customers using natural languages (Towes, 2022).

Natural languages processing has been from the beginning one of the main dimensions of AI, starting with ELIZA machine in 60s. However, only very recently it has become an influent component in AI, due to advancements in Gen-AI and the breakthrough made by OpenAI in 2020, when it launched a new technology based on GPT - generative pre-trained transformers (Johnson, 2022). The product itself (GPT-3, launched in 2022) has been able to successfully generate new digital content (Metz, 2020) and subsequent versions (GPT-3.5, GPT-4) improved its performance. GPT-based applications have facilitated natural language communication with artificial entities (Chui, Roberts, and Yee, 2023), contributing to the spectacular increase in the use of artificial intelligence, at an unprecedented pace, similar to a vertical growth model, which foreshadows fundamental changes, both in the field of technology and in humanity as a whole (Nosta, 2023). However, stable incorporation of conversational agents based on GPTs is not yet mature, as there are current limits on AI memory as conversation advances (Metz, 2020) as well as hallucination effect, namely content that is presented as certain but in fact it is made up by AI (Grant and Metz, 2023).

In terms of image generation through algorithmic creative processes, the successful methods used GAN – generative adversarial networks, which simultaneously trained two models: a "generator",

who's been tasked to create realistic objects, and a "discriminator", who's been tasked to distinguish between synthetic and authentic objects (Ragot, Martin and Cojean, 2020). The objective of this method is the gradually improve the performance of generator in order to achieve an equilibrium versus discriminator, meaning the latter inability to correctly identify the nature of creative objects. Therefore, algorithmic creativity could be defined as the process of generating new ideas with a high degree of novelty in autonomous manner by machines (Amabile, 2020). Alternative names for algorithmic creativity are synthetic creativity (Colton, 2008), computational creativity (Vakratsas and Wang, 2020) or artificial creativity (Runco, 2023). Algorithmic creativity allows marketing specialists to diversify their creative potential in condition of time and cost economy (Liu, 2023) with immediate perspective of its use in digital advertising (Chui, Roberts and Yee, 2022). Consequently, algorithmic creativity provides considerable opportunities in marketing to upgrade creative processes and enhance marketing campaigns (Vakratsas and Wang, 2020).

Experiments related to algorithmic creativity

The creative action derives from the ability of Gen-AI to autonomously create ideas with a high degree of novelty (Amabile, 2020). The creative process is similar to the way humans start from old ideas to generate new ones; in the case of artificial entities, using machine learning algorithms to generate new ideas (Hong et al., 2022), by combining deep learning techniques with natural language processing (Singh, 2023). The way of generating digital content by AI would thus be equivalent to the discovery of ideas or solutions (Runco, 2023), and by refining generative self-learning methods, it could reach a higher level of creativity as a result of exposure to a level of collective super-intelligence (Ameen et al., 2022). Currently, artificial entities are used with considerable success for fulfilling the following creative functions: content generation, information analysis, content improvement and post-production/editing workflows, and data compression (Anantrasirichai and Bull, 2021). Some researchers believe that the use of generative AI allows the exploration of new currents in the world of arts (Iansati and Lakhani, 2020) and opens new opportunities for sectors previously limited to the creative possibilities of physical objects, such as musical instruments in the field of music (Liu, 2023) and in other fields, such as visual arts, architecture, theater, film, dance, or literature (Oksanen et al., 2023).

We use a semi-systematic approach to identify previous experimental research on algorithmic creativity. Thus, we have identified studies in several areas, like visual content, written content or musical content. Several experiments have been conducted in last years with the aim to determine subjects' capacity to identify AI objects and their consequent reactions.

Visual content experiments

Authors	Subjects	Description	Results
Elgammal et al., 2017	21	Esthetic evaluation of paintings. Criteria: intentionality, visual structure, communication, inspiration	Subjects' perception varied positively when AI model has be changed to the one specifically trained
Chamberlain et al., 2018	65	Algortihmic identification of paintings depending on the order of presentation	Algorithmic identification was higher for experimental group who was tasked to evaluate esthetic level first and generative source afterwards

Chiarella et al., 2022	110	Creative evaluation of paintings depending on the order of presentation	Creative evaluation of AI work has been higher for experimental group who was tasked to evaluate AI first
Ragot, Martin and Cojean, 2020	565	Esthetic evaluation of 16 objects out of 40 paintings (50/50 human/AI)	Subjects preferred paintings made by humans
Ueda et al., 2021	260	Algorithmic identification of 80 paintings (50/50 human/AI)	Subjects were not able to significantly differentiate between human and AI paintings due to a specifically trained AI model
Agudo et al., 2022	249	Quality evaluation by known generative source	Subjects ranked AI work higher if they were told it was made by humans
Lyu et al., 2022	42	Differential quality factors evaluation by prompt qualification (prompt by artists vs prompt by non-specialists)	Subjects ranked AI work done based on artists prompt better in terms of accuracy, coherence and setting

Written content

Authors	Subjects	Description	Results
Bakpayev et al., 2020	205 (1) 217 (2)	Creative evaluation of written content depending on the content type and generative source	Subjects preferred human content when type was hedonist, and AI content when type was utilitarian
Gunser et al., 2022	120 (1) 302 (2)	Creative evaluation of written content (poems) depending on generative source	Subjects preferred hybrid written content (made by AI and refined by human specialist)
Hitsuwari et al., 2022	385	Creative evaluation of written content (haiku) depending on generative source	Subjects preferred hybrid written content (made by AI and refined by human specialist)
Longoni et al., 2022	3029	Trust evaluation of written content (news) depending on generative source	Subjects considered news marked as made by AI less trustful
Noy and Zhang, 2023	363	Time spent to create written content	Subjects who used AI tools spent less time to draft the content, but more time to refine it than those who create written content without AI tools

Musical content

Authors	Subjects	Description	Results
Hong et al., 2022	222	Creative evaluation of musical content (4 genres) depending on generative source	Subjects preferred work done by AI if previously exposed to indications about generative AI tools
Millet et al., 2023	206	Creative evaluation of musical content depending on generative source	Subjects preferred the melody marked as created by a human (both melodies were actually created through AI tools)

Analyzing results of these experiments we can draw several conclusions:
- Subjects manifest a significant bias upon generative source; work done by AI is usually considered inferior esthetically than work done by humans
- Subjects' ability to distinguish algorithmic objects from human-made objects is gradually disappearing due to technological advancements and better AI models
- Human collaboration with AI seems to be the optimal combination at the moment to generate best results in terms of creativity and esthetic level.

Relevance for marketing

The current level of Gen-AI allows for the creation of creative content, the generation of new ideas, and contributes to the accomplishment of reasoning tasks (Chui, Roberts, and Yee, 2023), which visibly and positively influences the intention to adopt this technology within companies (Wei and Pardo, 2022), and for the marketing function, it is expected to grow considerably in the coming period (Manis and Madhavaram, 2023). An important effect of the widespread use of generative AI is the opportunity to generate significantly more new ideas and objects, which allow for the accelerated development of human creativity with AI support (Eapen et al., 2023). Generative solutions like "text-to-image" and "text-to-video" have established themselves as very useful tools for obtaining visual digital content quickly and at reduced costs (Singh, 2023).
In the future, AI could influence almost all aspects of marketing, from strategy to customer interactions and content creation (Davenport et al., 2020) and contribute to enhancing creativity as an essential marketing asset for differentiation and innovation (Das et al., 2023).
Generation of new ideas and the creation of creative objects through generative AI programs largely meet the need for creativity in marketing (Amabile, 2020) and are suitable and of interest for application in the field of advertising, due to the fact that it is carried out after a structured process, yet flexible enough to generate creative ideas both autonomously and semi-autonomously (Vakratsas and Wang, 2020). The still nascent capabilities of generative AI offer interesting perspectives on the use of marketing content in future digital advertising campaigns (Kshetri, 2023).
On the other hand, the accelerated pace of development of generative AI could soon lead to the complete elimination of humans from the creative process (Shoshana, 2023), and consumer exposure to marketing content obtained through generative algorithmic means might make it impossible for them to distinguish reality from the simulated environment (Campbell et al., 2022).
Although Gen-AI is still in its early stages, companies have become concerned with finding immediate uses to incorporate its capabilities into products and services that they can launch on the market (White, 2023). The use cases are very diverse and allow companies to incorporate generative AI to create a new type of digital content marketing (Grant and Metz, 2023). Digital content marketing is typically used with the goal of increasing the level of interaction and trust with brands and includes

the creation and distribution of relevant information that highlights the respective brand to consumers through digital platforms (Hollebeek and Macky, 2019). The importance of digital content has grown considerably lately, as a result of the transformations brought about by social media on how people communicate, connect, and are influenced according to the social contexts in which they are placed (Rodrigues et al., 2023). Digital content marketing created through generative AI is promising in terms of the possibilities for creating a new type of content, previously unimaginable through analog or digital means, but it faces a preference for authentic content from consumers, who tend to extend this value also to the promoted product - which they might perceive as "fake" if promoted through algorithmic content (Campbell et al., 2022).

Traditional marketing methods have had limited success in personalizing the consumer experience (Kshetri, 2023), but the introduction of AI in personalization scenarios has brought successes with positive implications on the popularity of this technology in marketing (Kumar et al., 2019), especially since the costs required for personalizing the experience have been reduced by the emergence of more efficient AI models (Rust, 2020). Personalized advertisements have a positive influence on purchase intentions, but can rather be categorized as manipulative advertising (Campbell et al., 2022). Some studies have shown that a personalized approach in the retail sector allows for the optimal servicing of the top 1% of customers and generates 18 times more than the average value obtained per customer (Ameen et al., 2021).

Although personalization offers a superior level of consumer experience on an individual level, companies must first convince consumers to allow them to process the data collected about them (Frank, Herbas-Torrice, and Schvaneveldt, 2021). This will continue to be a challenge for companies, as some consumers may intentionally limit access to their personal data, to reduce the possibility of being profiled through AI and, potentially, being exposed to commercial discrimination through personalized pricing (Abrardi, Cambini, and Rondi, 2021).

One of the solutions found for facilitating personalization is the interactivity - integration of AI into consumer-used applications, such as virtual assistants or even in their hardware devices, like smart mobile phones (Coffin, 2022). Such a direction could more clearly capture the context in which the consumer is located, thus, personalization through AI could generate a much superior experience (Kshetri et , 2023).

Conclusions

Gen-AI could be an increasingly important source of productivity, enabling brands to take marketing to the next level and deliver truly personalized experiences in a way impossible until now (Kshetri et al., 2024). However, even though a majority of marketing practitioners (59%) recognized personalization as the most useful application of AI in current landscape, they face a possible mistrust from the customers when they feel they are exposed to algorithmic content (Moradi and Dass, 2022). It remains to be seen upon future research and practical experiments whether a highly personalized experience combined with real-time interactivity with trained AI conversational agents may influence positively or not the effectiveness of marketing actions.

Regardless of effectiveness, several ethical consequences will have to be thoroughly analyzed in the future: pseudo-creativity (divergence, rather than novelty), creative stagnation, hallucination effects and post-authenticity (fake identities and false content).

Marketing practitioners are facing a change they know so little at the moment. Intuitively, they will expect that incorporating algorithmic tools to enhance creativity will take time and it will happen on a case by case situation, not challenging human creativity. On their side there is a strong consumer sentiment on social reaction called "uncanny valley", which describes a sudden change of an initial favorable reaction to a non-human object when it becomes too close to human level and it will draw a radical decrease of acceptance and it will trigger most likely a rejection (Hollebeek et al., 2024).

In time, this feeling may fade out and those marketers that start to use AI tools to enhance their work creativity will probably accumulate significant practical experience and will be in a better productivity position. Future research is needed to clarify AI differential effect on creativity, and also to analyze in-depth social response from customers. Research must be focused as much as possible on data and experiments, having in mind that technological advancements may be so fast that some conslusions may become obsolete quite soon. Nevertheless, they will constitute small steps on which humankind can build their understanding of the impact of a new technology that can challenge our specificity.

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