Prospective of graphic design in the age of artificial intelligence

La prospectiva del diseño gráfico en la era de la inteligencia artificial

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◈ **Abstract**

The aim of this article is to analyze the changes that graphic design faces in the era of artificial intelligence (AI). The methodology used for its development is diachronic, non- experimental, qualitative and documentary, allowing us to observe how Graphic Design has faced previous technological revolutions, and then to analyze specific AI technologies, platforms and software, in order to review their benefits and reflect on their prejudices.

The results describe that AI has significantly impacted Graphic Design, mainly in four aspects: image generation through text commands, automation of repetitive tasks, workflow management and predictions through artificial vision.

In the conclusions is that AI is optimizing design work and democratizing the profession, but also implies a reappraisal of critical and creative skills that machines cannot replicate, as well as a constant updating in the use of new tools and emerging technologies.

Keywords: fundamental theory, graphic design, exploration, analysis and research.

◈ **Resumen**

El objetivo de este artículo es analizar los cambios que el diseño gráfico enfrenta en la era de la inteligencia artificial (IA). La metodología utilizada para su desarrollo es diacrónica, no experimental, cualitativa y documental, permitiendo observar cómo el Diseño Gráfico ha enfrentado revoluciones tecnológicas anteriores, para después analizar las tecnologías, las plataformas y los software específicos de IA, con el fin de hacer una revisión sobre sus beneficios y reflexionar sobre sus prejuicios.

En los resultados se describe que la IA ha impactado significativamente el Diseño Gráfico, principalmente en cuatro aspectos: la generación de imágenes mediante comandos de texto, la automatización de tareas repetitivas, la gestión de flujos de trabajo y las predicciones a través de visión artificial.

Entre las conclusiones se deduce que la IA está optimizando el trabajo de diseño y democratizando la profesión, pero también implica una revalorización de habilidades críticas y creativas que las máquinas no pueden replicar, así como una actualización constante en el uso de nuevas herramientas y tecnologías emergentes.

Palabras clave: teoría fundamental, diseño gráfico, exploración, análisis e investigación.

◈ Introduction

AI, defined by the Organization for Economic Co-operation and Development (OECD, 2019), consists of machine-based systems capable of making predictions, recommendations, or decisions. It has evolved significantly since its conception in 1956, when, at a conference at Dartmouth College in Hanover, New Hampshire, the word was coined by John McCarthy (Moor, 2006). This technology has progressed from the chatbot Eliza in 1966 (Weizenbaum, 1966) to the current ability to generate images, text, video, music, and entirely new codes (United Nations Educational, Scientific and Cultural Organization [Unesco], 2023). Over time, other strands of AI have emerged, such as Generative Artificial Intelligence (*GAI*), whose characteristic is to create new data or content from existing ones, using machine learning algorithms (Sadiku and Musa, 2021).

These topics have been studied by different researchers, including McCarthy *et al.* (2006) and Amit Agrawal (2018), who turned his attention to the rapid impact of *AI* on the computer graphics industry. For his part, Philip Boucher (2020) approaches the topic from the context of the growing prominence of *AI* as a defining technology of the last decade and the next. He also describes two types of *AI*: symbolic, which encodes knowledge and experience into rule sets, and data-driven, which improves performance through training with data. Among the challenges, the author finds transparency, bias, and the distribution of costs and benefits. He offers recommendations to address these challenges, which include creating an enabling economic and political context, promoting competitive ecosystems, improving the distribution of benefits and risks, strengthening against problematic outcomes, increasing transparency and accountability, developing skills and education, implementing ethical frameworks, promoting diversity in the workplace, improving inclusion and equality, and promoting reflection and dialogue.

Focused on the impact on graphic design, Verganti *et al*. (2020) reflect on whether *AI* is just another digital technology that, like many others, will not significantly challenge what we know about design, or whether it will create transformations in design that our current frameworks cannot capture. In addition, they present two pioneering cases at the frontier of *AI*: Netflix and AirBnB.

The authors found that *AI* does not undermine the tenets of design, but rather allows us to overcome past limitations (in scale, scope, and learning) of human design processes. However, they note that AI profoundly changes the practice of design, so they propose a new framework for understanding design practice in the age of *AI*. They note that as creative problem solving is significantly performed by algorithms, human design increasingly becomes a sense-making activity, i.e., one that requires understanding what problems make sense to address.

For his part, Meron (2022) considers that, just as electronic publications, multimedia, web and social networks influenced and presented challenges for graphic design, now the implementation of *AI* allows professionals to automate many design processes. However, this threatens to de-professionalize the career and create a second tier of "non-professional" designers. This author argues that the lack of academic engagement by graphic designers with their own practice and *AI* research, has resulted in computer scientists supplying of functional approaches to *AI* design; recognizing that discursive and methodological differences between computer science and graphic design hinder interdisciplinary collaboration, and places the onus on design practitioners and researchers. The problem study by Bahaa Mustafa (2023) examines the impact of *AI* on the graphic design industry. His research explore how *AI* is used in graphic design, including its impact on workflow, creativity, and design quality. He presents five case studies and a methodology based on literature review, as well as interviews and surveys. The author finds benefits such as improved workflow, greater creativity and better results, while challenges include the risk of job loss, the technical skills required to do the job and the ethical implications; finally, his recommendations include empowering designers to use *AI*.

Sara M. Rezk (2023) approaches the topic through the history of *AI*, showing the different types of artificial intelligence and the various applications. She then discusses the impact of *AI* on graphic design. As advantages, Rezk lists: the reduction of human error, the ability to work 24/7 versus the human ability to work six to eight hours, the elimination of repetitive work, design by digital assistants, accelerated decision making, rational decision making, improved safety, and more efficient communication. Among the disadvantages, Rezk finds cost overruns resulting from increasing the capabilities of the computer equipment, talent deficit, high dependence on computers, need for continuous human supervision.

On the other hand, Wernersson and Persson's (2023) findings are presented from semi- structured interviews to discover the attitude of professionals towards AI, yielding that most graphic designers are not afraid that it will take away their work, but on the contrary, they believe that it will make their work more efficient.

They also acknowledge that there is a debate in universities about whether AI should be taught to graphic designers. For their part Tomic *et al.* (2023) give an overview of how AI algorithms can help designers choose font and color combinations by analyzing data and offering visually appealing options, which helps professionals make informed decisions, this because AI can analyze design briefs and suggest different layouts and compositions based on design principles and best practices, all analyzed through AI-powered tools such as BrandCrowd, Vinci and Adobe Target. Of all these, the last one allows website personalization. The authors aim to analyze whether designers have reason to fear being replaced by AI in the future and conclude that there is no reason for them to consider it as a threat.

Meanwhile, Iram Fatima (2023) analyzed DALL-E, MidJourney, Stable Diffusion, Canva, Adobe Sensei, and Microsoft Designer as tools that improve productivity but still depend on the designer's skills. It employed the Research through Design (RtD) approach with a preliminary study to understand the context of AI tools in design; gathered insights from professional graphic designers through a survey and, to explore future scenarios, developed an interactive prototype called Desain, which was used to provoke discussions and gather feedback from designers, through user studies and interviews. The results show that graphic designers see AI as a tool to improve effectiveness, stimulate creativity and increase productivity in design; that they recognize the inevitability of its presence in design and the importance of adopting it. AI is thus perceived as valuable to new designers as it provides them with resources and support in their design process and client interactions; however, there are concerns about their ability to fully understand and meet design goals, as well as potential design practices neglected and facilitated by AI.

The impact of AI on the profile of graphic designers

The integration of artificial intelligence in Graphic Design has generated controversy among the community, initially and mostly due to the media dissemination of images generated by platforms such as MidJourney. Although this topic raises important ethical and legal implications, the study of the subject by designers must go beyond the use of third-party images. The main reason for the necessary general approach to the topic is that, since 2023, AI functions have been integrated into the digital tools that designers have been using for decades; such is the case of the Adobe suite, which has incorporated AI functions into its main software, so since 2024 it is a reality put into practice by every graphic design professional.

For academics, teachers, researchers and developers of Graphic Design curricula, the advent of AI carries didactic and pedagogical implications (Verganti *et al.,* 2020), while institutions are developing plans for the incorporation of AI in academic life, teaching practice (Universidad Autónoma de Baja California [UABC], 2024).

For these reasons, the general objective of this research has been to analyze the impact of AI on the future of Graphic Design, while the particular objective focuses on projecting the skills that will be required to be taught to Graphic Design students in the AI era. The justification lies in providing valuable analyses to improve educational strategies and optimize the use of AI in the teaching of graphic design, benefiting both students and teachers.

Limitations include the rapid evolution of artificial intelligence technologies, which may render some results obsolete in a short period of time. The accelerated nature of technological advances means that conclusions based on the current state of technology may not be applicable in the near future. In addition, the study faces the absence of empirical studies of its own to validate, in the specific context of the research, the qualitative observations presented. The empirical data worked with come from a combination of sources, which could influence the validity of the conclusions in the regional framework; however, the originality of the proposal lies in providing a starting point for a prospective analysis in the face of the irruption of AI. Thus, this study contributes to the initial understanding of the changes and challenges that emerging AI technologies impose on the global field, serving as a basis for future research that could build on these preliminary findings. The research opens the door to further exploration and empirical validation of qualitative observations through subsequent studies, adapting to the continuing evolution of the technology.

The study is based on theories of technological evolution promoted by authors such as Ian Miles (2010), Michael Keenan *et al.* (2008) and Ben R. Martin (2010), who have developed the concept of *technology foresight*. This theory focuses on exploring and anticipating the future by considering technological advances and emerging trends, and has been applied to different areas, such as economics, business, telecommunications and urban design.

Following this theory implies the construction and exploration of different possible scenarios for the future of Graphic Design. Considering technological advances and emerging trends, "organizations must be prepared for the technological changes presented by their environment and anticipate them in order to adjust their technological strategy. This is achieved through technological foresight" (Flores-Agüero *et al.,* 2021, p. 1).

The technological approach as a determining factor in the professional profile of the graphic designers is based on the premise that, historically, technology has defined the skills that need to be developed in their training.

◈ *Methodology*

For this research, which is projected diachronically, a non-experimental, qualitative and documentary methodology is adopted. This approach allows analyzing the phenomenon through the interpretation and analysis of existing information and documents, such as articles, previous studies, historical records and academic literature, which enables a diachronic approach that helps to understand the current state and contextualize the evolution of technology in Graphic Design, establishing axioms to deduce conclusions.

This methodology was chosen because graphic design, as visual communication, is part of social phenomena. These phenomena "are not the heritage of a single discipline but require different areas of knowledge that, with their respective approaches and tools, achieve a more complete and consistent analysis" (Rojas Soriano, 2013, p. 23).

Traditionally, three types of comparison are used in the social sciences: historical, statistical and qualitative studies. In this research, statistical comparison is not used, but historical and qualitative comparison is used, since, as Tonon (2011) points out, the comparative study allows contextualizing and generating new hypotheses.

Work tools as a defining factor of the graphic designer's skills

Several authors have explored the historical changes in Graphic Design analyzing the technological and prospective aspects. Andrés Felipe Roldán (2015) highlights that, in its beginnings, graphic design lacked its own theoretical framework, which limited the reflection on its future. And that, therefore, the panorama of design is far from its beginnings, when it was considered more as an extension of arts and crafts. At that time, the main concern was to configure and determine form, prioritizing practice over theory, and limiting reflection to material [and technical] issues (Roldán, 2015). The initial absence of reflection on the profession is not surprising if we consider that the concept of design emerged in the Florentine Renaissance:

> referring to the graphic development of the idea that supports the creation in the three noble arts and, subsequently, in all areas, including the development of intangibles". Faced with the need for this specialized professional profile, Charles III founded in 1775 the first school of designers in the world in the Royal Factories, to supply these first mass production factories. (García Garrido, 2019, p. 241)

With such a pragmatic beginning, it is understandable that the construction of a reflective philosophy around design took time to develop. García Garrido (2019) also points out that, although design as a practice emerged in Prehistory as a functional, practical, communicational and aesthetic resource, it was not considered a concept or discipline until it was assigned a specific name. Giorgio Vasari, founder of the Accademia delle Arti del Disegno, used the term *design* in 1390. These two dates indicate that the adoption of the concept and the creation of the first school did not immediately imply a reflection on its definition, social impact, or prospective, but focused more on pragmatic aspects.

The first comparative studies on the subject focused on the history of design, since it allows to discover, recognize, reconstruct and interpret the meaning of the acts performed by humanity over time (Bloch, 2001). However, the objective is not to make history, but to resort to it to identify the consolidation process of our profession beyond the chronological data (Bermúdez Aguirre, 2018).

If the tools and work techniques have defined the professional profile in the initial centuries and, as Bermúdez Macías (2017) indicates: "There is a historical division of technology, between before and after the industrial revolution. Design, as a formalized area of knowledge, is born with an industrial technological approach" (p. 3).

We can follow the thread of the digitization of design to examine the profound impact of technology on the profile of the profession. In this regard, "Graphic design has been irrevocably affected by hardware and software" (Meggs and Purvis, 2009, p. 488), stated the influential design historian, Philip B. Meggs, in the fourth edition of his seminal work *History of Graphic Design*, the first edition of which did not include the chapter "The Digital Revolution and Beyond" until a decade later, when the impact of technological advances on the graphic design profession was first reflected upon.

During the 1980s and early 1990s, academics expressed concerns about the impact of digital technology on graphic design. Salinas (2015) collects testimonies from Graphic Design educators of that time, who expressed concern about the loss of manual skills that previous generations had practiced and exercised in their profession. Some detractors at the time questioned the use of computers in the training of designers, arguing that computers belonged to the engineers, while visionaries saw this simply as a change of tools, not of objectives. Indeed, design students replaced brushes and pencils with computers, but the fundamentals and theories prevailed.

In this regard, in the United States, during the same period, "many design training courses at art schools and universities became important centers for redefining graphic design through theoretical discourse and experimentation with computer technology" (Meggs and Purvis 2009, p. 492).

For example, the Cranbrook Academy of Art in Michigan, under the direction of Katherine McCoy, became a center of attraction for those interested in expanding the boundaries of design. This indicates that the shift toward a more thoughtful approach about to design emerged from technology. In this regard Meggs and Purvis (2009) point out:

> McCoy's educational approach evolved from a rational, systematic approach influenced by the International Typographic Style, to one that explored complexity, layered layout, vernacular and pre-modern forms, and the validity of norms and conventions. (p. 492)

Balmaceda et al. (2018) conducted a research among applicants to enter the career of Graphic Design at the National University of San Juan, Argentina, and found that the vision of the participants was reductionist by equating the notion of technology only to computational technology. In their conceptions, a particular (computational technology) assumes the place of the universal (technology in general), hindering a deep understanding of its essence. "This vision of the subjects addressed, undoubtedly, prevents them from assuming themselves as protagonists of technological development and relegates them to the role of spectators or uncritical consumers of technological products" (Balmaceda *et al.* 2018, p. 19). With studies such as that of María Isabel Balmaceda *et al.* (2018), it is possible to establish not only the notions of students, but also to reach a breakthrough, given that the relationship between technology and design became a formal research topic during the 2010s.

The leap towards digital represents a valuable opportunity to optimize the designer's work, allowing significant savings in time and resources. Although technology offers remarkable technical advantages, the importance of creativity, mastery of visual languages and in-depth knowledge of methodologies and techniques, such as the study of color, drawing and semiotics, cannot be underestimated. True effectiveness lies in the harmonious fusion of these aspects: knowledge, technique and technology, to achieve valuable results in design (Alonso and Valenzuela, 2020).

Thus, we can conclude this diachronic review by summarizing that Design emerged as an extension of arts and crafts, but it was during the industrial revolution when technology transformed its practice, adjusting it to the needs of production. It was at the end of the 20th century when the debate on the impact of technology on design began, and it was during the industrial revolution that technology transformed its practice, adjusting it to the needs of production.

The 21st century when the integration of artificial intelligence in design as a factor for a modification of the professional profile is required.

Uses of artificial intelligence in graphic design

Artificial intelligence has had a considerable impact on the field of graphic design, mainly in the automatic generation of images, the automation of repetitive tasks, task and workflow management, and tools that detect visual attention in design. The impact of each of these aspects is discussed below:

The legal implications related to images edited using graphic design tools are the precedent for today's concerns about the use of AI-generated images. During the 1990s, there was fear that images edited with Photoshop would be used as evidence in legal proceedings. For this reason, jurisprudence in some countries, such as Colombia, has dismissed:

> The probative value of photographs alone, especially when there are doubts about their authenticity or the correspondence between the image and the facts they are intended to prove. In these cases, other means of proof are required to support and corroborate the information contained in the photographs (Consejo de Estado de Colombia, 2003, p. 12).

Meggs already pointed out in 2009 that "Photography lost its status as an indisputable document of visual reality when software enabled undetectable manipulation of images" (Meggs and Purvis, 2009, p. 501). However, this undetectable status has changed a decade later, when Adobe, in collaboration with researchers at Berkeley, announced that they were working on developing technologies capable of detecting manipulations in images, with the goal of restoring trust in visual content (Adobe Communications Team, 2019). Adobe researchers Richard Zhang and Oliver Wang, along with UC Berkeley collaborators Sheng-Yu Wang, Dr. Andrew Owens, and Professor Alexei A. Efros, developed a method for detecting edits in images made using Photoshop's Face Aware Liquify feature, a project sponsored by the MediFor program of DARPA. This collaboration between Adobe Research and UC Berkeley marks a move toward image forensics, i.e., the science devoted to discovering and analyzing changes in digital images (Adobe Communications Team, 2019). During the development of their research, the authors explain that they began by "showing pairs of images (one original and one altered) to people informed that one of the faces had been modified" (Adobe Communications Team, 2019), and that "Our neural network tool was to significantly outperform the human eye in identifying edited faces" (Adobe Communications Team, 2019). The results showed that the human eye was able to detect the altered face 53% of the time, while the neural network tool achieved 99% effectiveness. This finding evidences a case where the developers themselves are looking for solutions to the problem posed.

However, there are separate claims regarding *AI* image creation on platforms such as MidJourney, which has generated controversy related to copyright infringement. In 2023, Sarah Andersen, Kelly McKernan, and Karla Ortiz sued Stability *AI* and Midjourney, as well as DeviantArt, for using five billion images from the web without consent from the original artists to train their *AI* tools (Vincent, 2023). Unlike MidJourney, other platforms, such as Adobe FireFly, have avoided legal problems by generating images from text using their own databases and as well as those voluntarily shared by users in Adobe's cloud. This seems to be the solution to the legal problem, so all that remains to be discussed is the concern that the proliferation of AI-generated images may distort the perception of social reality.

The ability to determine whether an image was generated using artificial intelligence is crucial to maintain trust in information. In this regard, Chui *et al.* (2023) believe that people must have the ability to determine whether an image was generated using artificial intelligence because society is based on trust in people and information. If it cannot be easily determined whether an image was generated by *AI*, our trust in any information will be eroded. In this case, explain Chui *et al.* (2023), special attention needs to be paid to vulnerable populations who may be particularly susceptible to adverse uses of this technology.

On the other hand, automating repetitive tasks using AI, such as cropping photos and replacing backgrounds, does not present legal dilemmas, but it does present ethical ones. Platforms such as Remove.bg, Photoroom, Facetune, Evoto, SiderAI and FireFly allow these tasks to be performed efficiently. In addition, FireFly makes it possible to obtain vector graphics from text commands and to generate color variations in vector graphics. These tools have been generally well received, as they do not present legal dilemmas.

The ethical dilemma about platforms such as Canva and Microsoft Designer, which offer the creation of design materials and the automation of documents for printing, as well as developments that allow building web pages through Artificial Design Intelligence developed by Wix (Goldstein, 2024), raises dilemmas about the democratization of design. These tools allow people without design training to use them, which has raised concerns about the impact on the employment of professional designers. However, they also benefit designers by allowing them to complete simple or complex work in less time.

Another possibility that *AI* introduces for graphic designers is the ability to manage large- scale projects, previously reserved for large design, advertising and *marketing* agencies. Now, with *AI* platforms such as Rocketium and Adobe Sensei, even small teams can compete on a professional level, democratizing and elevating the global reach of individual professionals.

Rocketium, in particular, automates the creation of hundreds of variants of an original composition through a spreadsheet programmed with generative *AI*, which receives instructions to change languages, formats for different social networks and visual aspects. This function frees the designer, who makes a single creation, while the *AI* executes all its variants, leaving the professional time to focus on conceptualization and creative direction. But it's not all about mass production, Adobe Sensei allows you to design work systems, organize a marketing campaign for a team of people, analyze campaign trends and perform market testing, even generate customized content for specific individuals, leveling the playing field between large and small design firms. According to Bassety (2023), *marketers* can use the generative *AI* built into Adobe Experience Cloud to improve business productivity and efficiency across all *marketing* workflows.

This suggests that design is moving closer to digital *marketing*, which should be reflected in the design curriculum.

Modifications have not only occurred in design creation and management tools; software has also emerged for attention prediction and visual tracking in AI-driven compositions, enabling graphic designers to correct human error —specifically visual syntax error— within a design, using data to enhance the effectiveness of their messages. One example is 3M's Visual Attention Software VAS, which predicts what viewers will see at first glance, helping to create functional designs. The company reports that its software has been created by neuroscience and data science specialists to quickly and accurately simulate how people will perceive visuals in the first three to five seconds, because, as they claim, that brief period is crucial to attract the audience's interest and create impactful designs. This software, which also integrates with Adobe Illustrator, Photoshop and XD, provides real- time feedback to optimize the visual composition. Thus, the software will indicate whether the syntax of the composition is correct according to the objectives set, that is, if the designer should give greater emphasis through color and proportion to any of the visual elements in the composition, such as the header or the brand name, or if any element of lesser importance, such as backgrounds or textures, is stealing the viewer's attention and preventing him from reading the main information. The data is reflected through percentages and heat maps. Similar tools include Attention Insight, Neurons and iMotions, among others.

These applications of *AI* in graphic design present no ethical or legal dilemmas, as they do not create from third-party works —although they do use previously collected data to predict trends— nor do they make composition tools available to the general public. They are aimed at design professionals to take inform compositional decisions using qualitative data and, if necessary, correct human errors.

Table 1. Cross-analysis of AI applications in graphic design with ethical, legal, professional, educational and social considerations.

	Software or platform	Legal considerations	Ethical considerations	Impact on the design profession	Impact on designer education	Social implications
Text to Image	Mid Journey Stable Diffussion Stability AI Adobe Firefly Canva	Infringement of copyrights when the sources images are from third parties No legal consider-ations when the images are from the developer's own files or from the user who has granted permis-sion.	Any untrained person can use them	Hand-drawn illustration job at risk	Not advance hand-drawn illustration skills necessary	The proliferation of AI-generated images may distort the perception of social reality
Task Automation	Photoroom Facetune Evoto SiderAI Adobe Firefly Remove.bg	None	Any untrained person can use them	Solves the designer's work in less time	Less mouse dexterity required	None
Automation of compositions [through text to image or vectors]	Wix Canva Microsoft Designer Adobe Firefly	None	Any untrained person can use them	Create a second level of "non-professional" designers. On the other hand, it democratizes the tools for users who would not hire a designer for a straightforward projec	Correctly understand the fundamentals, theories, terms and concepts of design to write an efficient text command.	The de-profes-sionalization of design
Task Workflow, and management automation	Adobe Seisei Roketium	None	None	A small workgroup could compete professionally with large organizations	Improve your management skills and broaden your digital marketing knowledge	Democratization of design
Composition review by artificial vision	VAS de 3M Attention Insight Neurons iMotions	None	None	Provide a rationale to the client for why one composition is superior than another, eliminating the bias of 'aestheti-cally pleasing design' by prioritizing 'functional design'	Basic quantitative and statistical data must be manages with skill and expertise	None

Source: created by the author.

AI in graphic design has revolutionized the way images are created and managed, automating repetitive tasks, enabling the generation of visual content efficiently and providing the capabilities to predict attention and visual tracking in compositions. However, this revolution is not without its challenges and important considerations, which are outlined below by category: AI image generation: Platforms such as MidJourney, Stable Diffusion, Stability AI, Adobe FireFly and Canva have democratized image creation, allowing users without specialized training to generate visual content. While this represents a significant advance, it also raises legal concerns about copyright infringement, especially when the images generated are based on third- party work without permission. In terms of academic and professional impact, the ease of use of these tools may jeopardize the specialization in illustration and, on an ethical level, it may change the perception of social reality, especially of the groups most vulnerable to the information gap.

Automation of repetitive tasks: Tools such as Photoroom, Facetune, Evoto, SiderAI, Adobe FireFly and Removebg, which facilitate tasks such as photo cropping and background replacement, present no legal dilemmas, but do present ethical ones. The automation of these tasks can be seen as a threat to the employment of professional designers and may promote the deprofessionalization of design, although it also frees up time for designers to concentrate on more creative aspects.

Automation of compositions by text-to-image or vector command: Platforms such as Wix, Canva, Microsoft Designer and Adobe FireFly allow the creation of compositions from text, which could be perceived as a threat to the employment of graphic designers. Similarly, the social impact of creating a second tier of "non-professional" designers is reflected in the proliferation of poor visual communication systems. However, these tools also offer the opportunity to improve efficiency and allow designers to focus on higher-level tasks. At the academic level, design fundamentals (semiotics, color theory, Gestalt, composition, typography, usability), vocabulary skills to write efficient text commands and introduce AI tools, concepts, operation and development should be preponderant.

Task and workflow management and automation: Adobe Sensei and Rocketium offer advanced capabilities for managing projects and automating workflows, enabling small teams to compete with large organizations. This not only democratizes graphic design, providing small teams with greater management capabilities, but also encourages designers to enhance their skills in strategy, problem-solving, project management, and negotiation, as well as knowledge of virtual communities and digital *marketing*.

Composition review with predictive analytics through computer vision: Tools such as 3M's VAS, Attention Insight, Neurons and iMotions use *AI* to predict design functionality, helping designers to base their decisions on data to improve their compositions. These tools present no ethical or legal dilemmas and are aimed at design professionals, but he points out that designers must become skilled in quantitative data management and thought processes.

In short, *AI* is transforming the field of Graphic Design, offering new opportunities and challenges. While automation and *AI* image generation raise ethical and legal issues, AI also free designers time to focus on conceptualization and problem solving. It is crucial that designers adapt to these new tools while maintaining a balance between technological efficiency and human creativity.

Regarding design research, it is agree with Roldán (2015), who considers that researchers need to adopt a critical look towards the discipline, exploring its foundations and continuously reflecting on its conceptual bases. "This implies redefining design as a creative activity, a method to address problems and a thinking process. It also implies expanding into other areas of knowledge, finding points of convergence and applying adequate theoretical rigor to articulate it as a discipline" (Roldán, 2015, p. 23).

◈ Conclusions

The introduction of *AI* in design suggests a change in the skills required of designers, so the curriculum of the next decade should focus on the understanding and correct application of design fundamentals, theories and concepts to create efficient instructions for *AI*. Therefore, the designer will need greater vocabulary skills and language to dictate efficient text commands. This marks a shift from manual dexterity with analog instruments to conceptualization and problem solving skills.

While *AI* offers opportunities to optimize design work and democratize the profession, it also poses ethical and legal challenges that must be addressed. Adapting the professional profile of the designer to the presence of *AI* —include skills in management, consulting and creative strategy— presents itself as a solution for delving into this new era of Graphic Design.

This shift in focus requires new theories and brings design closer to leadership, which is inherently a meaningful activity.

The profession of graphic designer is far from disappearing due to *AI* tools, but its implementation will happen properly only if we academics are dedicated to boosting the development of institutional capabilities in terms of research, infrastructure, digital culture and ethical framework of artificial intelligence. ◉

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